THE AEROPLANE and ASTRONAUTICS

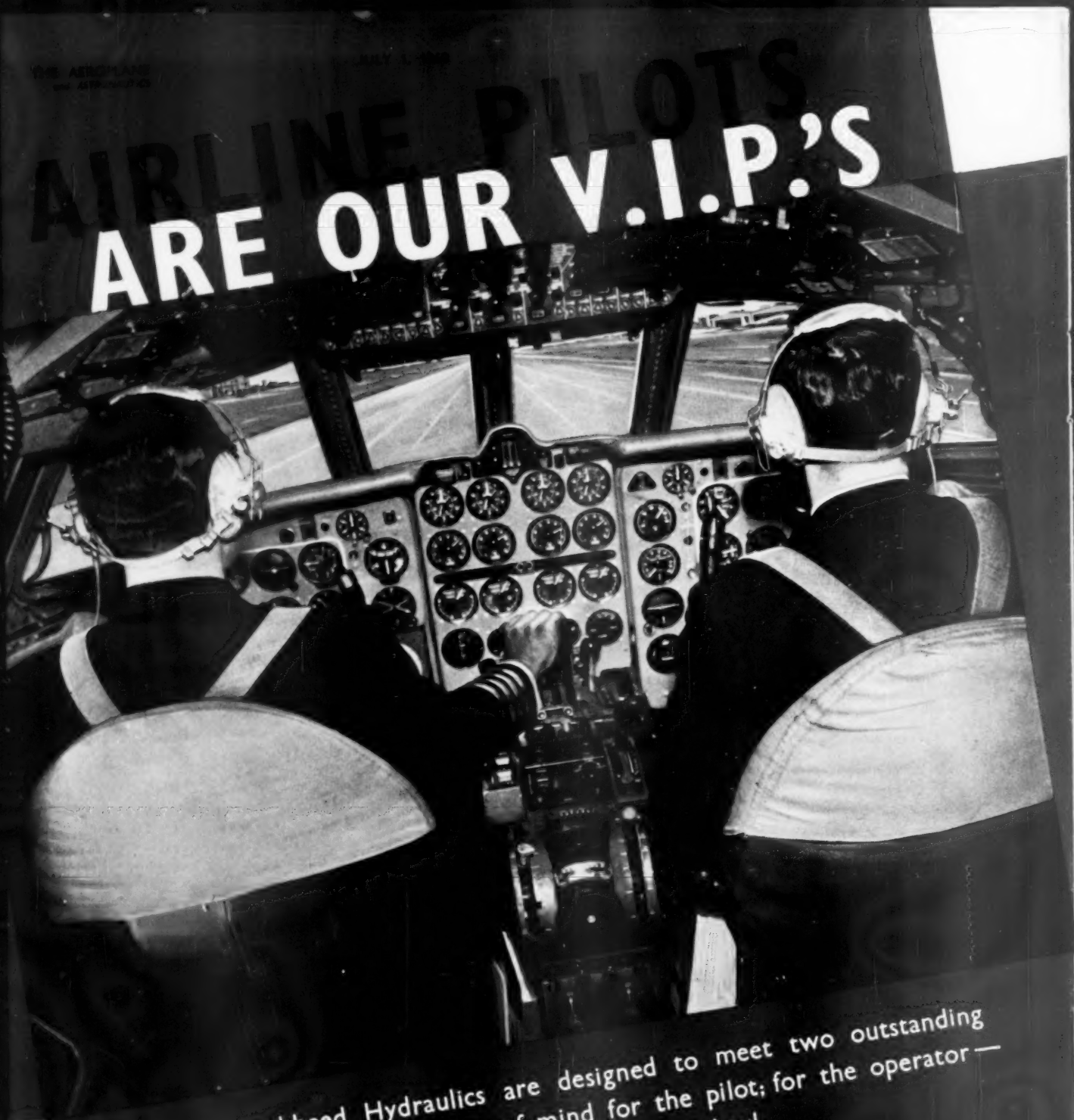
ENGLISH ELECTRIC LIGHTNING

ENGLISH ELECTRIC AVIATION LIMITED

MEMBER COMPANY OF BRITISH AIRCRAFT CORPORATION

HORTON

AIRLINE PILOTS ARE OUR V.I.P.'S



Lockheed Hydraulics are designed to meet two outstanding requirements—peace of mind for the pilot; for the operator—long trouble-free periods between overhaul.

Photograph by courtesy of B.O.A.C.

Lockheed

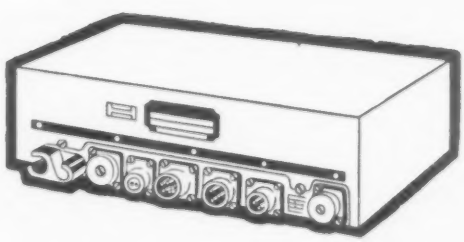
REGD. TRADE MARK

LOCKHEED PRECISION PRODUCTS LIMITED
SHAW ROAD, SPEKE, LIVERPOOL 24

ONE OF THE AUTOMOTIVE PRODUCTS GROUP

Photograph by courtesy of Rolls-Royce Limited.

Proved performance in engine controls



The Ultra A.605 Turbine Speed and Jet Pipe Temperature Control, fitted to Rolls-Royce Conway Engines in Boeing 707 aircraft.

The high reputation of Ultra Electric Engine Controls is firmly based on a long and extensive record of outstanding accuracy and outstanding reliability. They are fitted to the latest British jet and turbo-prop engines.

ULTRA

ULTRA ELECTRONICS LIMITED

WESTERN AVENUE · LONDON · W.3 Telephone: ACOrn 3434

RADIO AND RADAR SYSTEMS · AIRCRAFT ENGINE CONTROLS AND INTERCOMM · DATA PROCESSING

▲

* short take-off and landing

NOW THE STOL* HERCULES

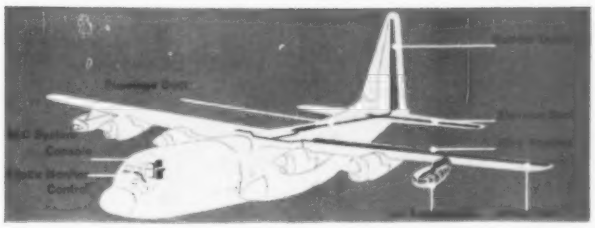
A boundary layer control system, which will spectacularly shorten the already astonishingly brief take-off and landing runs of Lockheed's versatile 61-ton C-130 Hercules transport, is now in an advanced stage of development and flight test.

The Lockheed BLC system culminates many years of study by Lockheed engineers and follows four years of research devoted to specific application of the system to the Hercules.

Four auxiliary jet engines, weighing only 500 pounds each, will furnish the streams of high pressure air which flow over all control surfaces. The BLC jet engines are each connected to a central system providing air evenly to all surfaces even with one engine out.

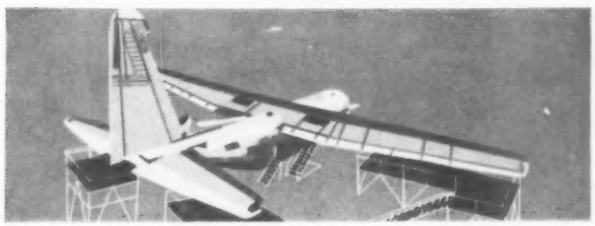
Manufacturing work on the BLC Hercules can begin now because 80% of the airplane is identical to the C-130 B. In Europe, a nation or group of nations could manufacture the C-130 B and have a European version flying in less than half the time required by a new untested design. The program could then be phased into the more advanced BLC Hercules. Know-how acquired by Lockheed in manufacturing nearly 300 C-130s to date can make the BLC Hercules European manufacturing project the most rapid and inexpensive answer to the needs of European nations for a high performance, all-purpose transport.

As a combat transport of men and equipment the C-130 showed its superlative value in airlifts to Lebanon and Turkey.



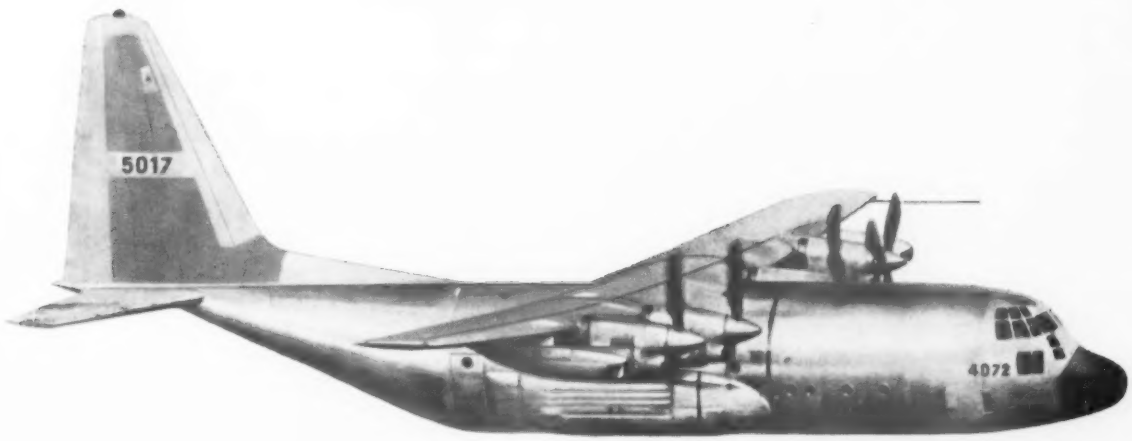
Boundary Layer Control

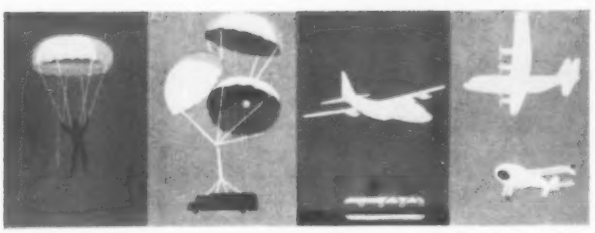
This illustration shows the Boundary Layer Control system of the Hercules. A pod under each wing carrying two small modified jet engines bleeds air which flows over all control surfaces, ailerons, flaps, rudder and elevator greatly reducing stall speed of the 61-ton transport.



Licensed manufacture

The Hercules is easily adapted to licensed manufacture. Plans for its production in Europe by a nation or nations cooperating with Lockheed have been carefully studied. Results emphasize spectacular saving of both money and time.





Versatility

The excellent range capabilities of the C-130 enable it to perform long search and patrol missions. Moreover, it can be easily adapted to many different mission configurations including Paratroop Drop, Aerial Cargo Delivery, Air Rescue, Drone Launcher / Director Aircraft, Troop Carrier, Air Refueling, Aerial Mapping and Surveying, etc.

Soft Field Take-off and Landing

The unique landing gear design of the C-130 permits it to operate from soft, unprepared fields. High gross-weight landing tests have been made on grass, sand and pierced steel plank. The C-130 is the largest aircraft to be equipped with skis for snow and ice landings.

Jet Transports - Jet Fighters - Jet Trainers - Commercial & Military Prop-Jet Transports - Rocketry Ballistic Missile Research & Development - Weapon System Management - Anti-Submarine Patrol Aircraft Nuclear-Powered Flight - Advanced Electronics - Airborne Early-Warning Aircraft - Airport Management - Nuclear Reactor Design & Development - Ground Support Equipment - World-Wide Aircraft Maintenance

LOCKHEED

. . . serves a **7** course meal on the Comet 4 Monarch Service . . .

Seven delicious courses served seven miles up to 48 passengers—and the whole meal, from start to finish, taking less than 1¼ hours. That is Monarch service and it's all done with G.E.C. air circulation ovens, hot beverage containers, hot cups and urns, in two cleverly designed galleys.

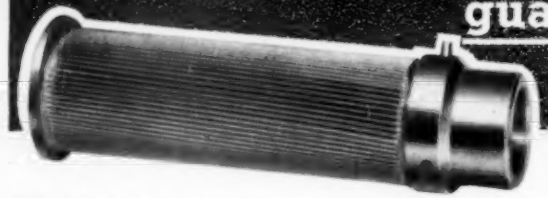
When fitting out the galley of the Comet 4 for luxury catering, B.O.A.C. naturally called in G.E.C.—unquestionably the world's foremost supplier of aircraft catering equipment.

one of 100 International and Domestic Airlines using

G.E.C. catering equipment

THE GENERAL ELECTRIC COMPANY LIMITED, MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

Vokes new filter media with guaranteed 100% efficiency



. . . widely used in American aircraft and missile programme

POROLOY CM.

Vokes now introduce a new all metal filter medium of outstanding efficiency for the *controlled* filtration of hydraulic and lubricating oils, fuels, air, gases, acids, caustics and related caustic materials, chemicals and solvents at extreme temperatures and pressures. Poroloy CM filter elements can be made in any size or shape from a variety of metals—Stainless Steel, Inconel, Nickel, Copper, Steel and Nichrome being the most popular—features which, combined with special production techniques to give controlled pore configuration, enable filters to be individually designed for special applications. Metals can be selected with the particular requirements of the application in mind and the size of the pores can be controlled to deal with particles of between 2 and 250 microns. Poroloy CM filters are therefore 100% effective against a stated particle size, *the danger of media migration being eliminated by an accurately controlled sintering process.* The ultimate tensile strength of the elements varies from 2,000 to 60,000 p.s.i. and the operating temperature range is from −400° F to 1200° F.

The unique combination of properties found in Poroloy CM has led to its recent use in critical temperature conditions in the United States missile and aircraft industries, including installation in the Boeing 707.

POROLOY T.

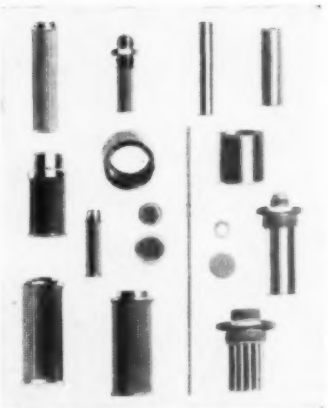
Similar in performance to Poroloy CM but manufactured by a different process, Poroloy T has an operating temperature range from −400° F to 1500° F. Pore size ratings are from 2 to 250 microns and tensile strength varies from 2,000 to 100,000 p.s.i.

This illustration shows the many sizes and forms—seamless tubes, flat discs, corrugated elements etc.—in which Poroloy can be manufactured.

Both filter elements are manufactured in conditions of micro-cleanliness and before despatch are individually checked for performance in bubble point testing equipment.

Poroloy was developed by the California Institute of Technology and is manufactured in the U.K. under license from the Bendix Aviation Corporation, U.S.A.

Write now for fully illustrated technical literature.



VOKES

VOKES LIMITED · HENLEY PARK · GUILDFORD · SURREY

Tel: Guildford 62861 (6 lines). Telex: 8-535 Vokesacess, Guildford. Grams & Cables: Vokesacess, Guildford, Telex.

Vokes Australia Pty. Ltd., Sydney. Represented throughout the World.

V.532

Decca heightfinding radar

Decca build great radars

The HF 200 is the most advanced height-finding radar available to-day and is designed to meet the military needs of the missile age. This radar is in wide use as an essential part of many classified military projects and civil surveillance radar systems.

The HF 200 is a high power, long range radar employing hydraulic control systems and the latest microwave techniques in S-band. It provides accurate height information at a high data rate and is, therefore, ideally suited for integration as a vital part of a modern-isation programme. Operational use proves that the HF 200 is more than capable of solving the challenging problems of heightfinding in modern air defence.

DECCA RADAR

Decca Radar Limited · London · England

DR130a

B

Powered by the Blackburn A.129 mark 3 free turbine engine rated at 970 s.h.p. 5 min. power, but derated to 650 s.h.p., the P531 offers maximum performance even under high temperature and high altitude conditions.

operational adaptability

This ability to operate all over the World, together with the combination of manoeuvrability and high load carrying capability which is a feature of this helicopter, makes it particularly suitable for Army use in the

Reconnaissance/Liaison role.

When used for reconnaissance it may be fitted with day/night camera installation or a variety of weapons including machine guns and rockets for suppressive fire.

In the liaison role it may be used for staff transport, casualty evacuation, logistic air support, and battle surveillance. Conversion to various roles is a simple operation.

In short its operational adaptability can provide the Army with that ever essential factor — tactical mobility.

WESTLAND *the great name in* **HELICOPTERS**

WESTLAND AIRCRAFT LIMITED · YEOVIL · ENGLAND

incorporating SAUNDERS-ROE DIVISION, FAIREY DIVISION AND BRISTOL HELICOPTER DIVISION

THE AEROPLANE and ASTRONAUTICS

VOLUME 99 NUMBER 2541 JULY 1, 1960

Whose Responsibility ?

Since the first of the new air-cushion riders made its debut just over a year ago, there has been a widespread and lively debate as to whether or not such a vehicle should be considered an aircraft or simply a special form of amphibious surface transport. There are those who argue that as such craft depend on a ground or water surface for their sustentation, they are most certainly not aircraft. On the other hand, there are those who maintain that as they are in fact airborne there is no argument. There are even some who believe that cushion-riders are neither fish nor fowl but in a category all of their own. It will be a long time, we suspect, before these arguments are satisfactorily resolved.

Even to those more directly concerned, the problem is of considerable importance—for when these promising craft become public transport vehicles, licences will doubtless be needed. And licences always bring with them all sorts of subsidiary statutory rules and requirements.

Two distinct problems would seem to be involved. In the first place there is the safety of the vehicle *per se* and the possible need for some official control of its design and manufacture. And there is the operational aspect with the possibility of having to conform to certain movement regulations.

For the present, though, only the first of these considerations arises. Certainly a case can be argued for the need to have some sort of certificate of safety; the question is, in such an event, who should be the responsible body?

On the evidence to date it would seem that the basic design principles of these new craft are such that low structure weight is of paramount importance to their operating economy; this dictates the adoption of aeronautical structural-design practices. Moreover, although such a craft does not fly in the accepted sense, when airborne on its cushion its stability and control problems have a decidedly aeronautical flavour. On both of these counts it is better that any regulatory safety requirements should be laid down by a body familiar with the principles involved. In this, who more suitable is there than the Air Registration Board?

At present the situation seems to be that the Ministry of Aviation has already adopted a measure of responsibility for the cushion-riders and indeed—through the A.R.B.—appears to have exercised a noteworthy initiative in this respect. Officially, at any rate, the first of these craft are reckoned to be *air*craft and for this reason both the Hovercraft and the Cushioncraft prototypes have, in fact, been given official British registration marks.

However, though this might well apply at the present initial stages of development in this particular direction, it should not be assumed too readily that this state of affairs need necessarily be perpetuated. The fundamental question still to be answered is whether further development of this radical form of transport vehicle should proceed unchallenged and unfettered by regulations—which by their very nature have to be restrictive—or whether the air-cushion-riding craft is intrinsically so complex as to need the protective umbrella of a safety authority. Either way, events are moving fast enough in this new field for a decision on this important question to be a matter of some urgency.

Editor - - - - - THURSTAN JAMES
Deputy Editor - - - - F. T. MEACOCK

Founder Editor (1911-1939) *C. G. Grey*

Proprietors: TEMPLE PRESS LIMITED
Chairman and Managing Director:
ROLAND E. DANGERFIELD

Editorial, Advertisement and Publishing Offices:
BOWLING GREEN LANE, LONDON, E.C.1

Telephone: TERminus 3636
Telegrams: "Pressimus London Telex"
Telex: 23839

Annual Subscription Rate: United Kingdom £4 15 0
Overseas £5 Canada and U.S.A. $15.00

© Temple Press Limited, 1960. The proprietors will consider any written requests to reproduce articles and illustrations appearing in this journal. Comment and brief extracts which acknowledge *The Aeroplane and Astronautics* are permissible.

Matters of Moment

Competitions at Coventry

AT the end of next week—on Jly. 8 and 9—the Coventry Air Pageant and National Air Races are being held at Baginton aerodrome. Eliminating contests for the Lockheed International Aerobatic Competition and practice flying for the King's Cup Air Race will be held on the Friday, Jly. 8. The finals of both these events together with air display items will form a full and interesting programme on the Saturday.

Highlights of the flying displays will be formation aerobatics by Hunters of No. 111 Squadron and by a team of Jet Provosts from Little Rissington. Other R.A.F. aircraft to appear will be a Chipmunk, a Valiant and a Britannia. The U.S.A.F. will give a demonstration of flight refuelling in which a KB-50 will simultaneously refuel an F-100, a B-66, and an F-101. Other displays will be given by a Spitfire and by the Piper range of executive aircraft. There will also be glider aerobatics.

For Saturday, Jly. 9, the day's events start at 09.30 hrs. with practice flights for competitors in the King's Cup Air Race. These will go on until noon, when the first part of the air display programme begins. From 12.30-14.00 hrs. the aerodrome is open for visiting aircraft after which there are more display items. The final of the Lockheed Trophy is scheduled to start at 14.25 hrs., to be followed by a further air display until the start of the King's Cup Air Race at 16.00 hrs. The afternoon's programme ends with the prizegiving at 18.00 hrs.

S.B.A.C. Executive

ANNOUNCING that Sir George Dowty, F.R.Ae.S., M.I.Mech.E., F.I.A.S., Hon. F.C.A.I., has now taken office as its president for 1960-61, the Society of British Aircraft Constructors has also given news of the election of the Hon. George Nelson, M.A., M.I.C.E., M.I.Mech.E., M.I.E.E., as its vice-president and that Sir Aubrey Burke, O.B.E., M.Inst.T., F.R.S.A., the immediate past-president, will—as is customary—become deputy president. The Society's treasurer will continue to be Sir Frederick Handley Page, C.B.E., Hon. F.R.Ae.S., F.C.G.I., Hon. M.Inst.T., Hon. F.A.I.S.

In his new office Sir George Dowty's first major task will be to act as host at the Society's annual Display and Exhibition at Farnborough during the early part of September. He is, of course, no newcomer to S.B.A.C. affairs, for he has been its vice-president since 1958, a member of council since 1954, chairman of its Equipment Group Associate Members Committee 1954-56 and deputy chairman 1956-58.

Born in 1901 and educated at the Royal Grammar School, Worcester, Sir George has had a long and very close association with aeronautical affairs. He founded Aircraft Components, Ltd., in 1931 (the company's name was changed to Dowty Equipment, Ltd., in 1940) to specialize in aircraft undercarriage design. From this small beginning he has built up the large group of companies, of which he is chairman and managing director, which enjoys an international reputation and has a widely diverse range of products. He received his Knighthood in the 1956 Birthday Honours, was awarded the Edward Busk Memorial Prize in 1937 and the British Gold Medal for the Advancement of Aeronautical Science in 1955.

NEW PRESIDENT.—Sir George Dowty, president of the Society of British Aircraft Constructors for 1960-61.

Sir George was president of the Royal Aeronautical Society for 1952-53. He is president of the North Gloucestershire Productivity Association, is a governor of the North Gloucestershire Technical College, and chairman of the Industrial Development Board for Malta.

The Hon. George Nelson has been managing director of the English Electric Co., Ltd., since 1956 and a member of the S.B.A.C. council since 1941. He was recently appointed deputy chairman of the new British Aircraft Corporation.

He has been closely associated with the post-war development of the English Electric company in the military aircraft field. When the Napier company was taken over by English Electric in 1942 he became its managing director, and in 1949 was appointed deputy managing director of the parent concern.

Sir Aubrey Burke, chairman and managing director of the de Havilland Aircraft Co., Ltd., and deputy managing director of the Hawker Siddeley Group, has been a member of the S.B.A.C. council since 1946. He was vice-president for 1956-58.

"Pick-a-Back" Satellite

A NEW technique of satellite launching was demonstrated for the first time on Jne. 22 when a two-stage Able-Star rocket, launched from Cape Canaveral, carried two instrumented satellites into space at the same time. Taking the form of two spheres of 36 in. and 20 in. diameter, the satellites were joined together by clamps and were thrown apart by the action of a spring mechanism when they arrived in orbit.

The larger vehicle, Transit 2A, weighs 223 lb. and is being used for testing a satellite navigational system. Details of the proposed operational method were given in THE AEROPLANE

AIRBORNE.—Taking-off for the first time from Woodford aerodrome, Cheshire, the prototype Avro 748—powered by two Rolls-Royce Darts—sets out on a 2¾-hour maiden flight on Jne. 24.

NEW FEEDER-LINER.—This first air-to-air photograph of the Avro 748 on its maiden flight shows to advantage its clean and straightforward lines. A feature article and cutaway drawing of this new turboprop transport will appear in THE AEROPLANE AND ASTRONAUTICS next week.

AND ASTRONAUTICS, Nov. 6, 1959. The U.S. Navy, which has a big interest in these experiments, has plans for using an operational Transit system for the precise positioning of Polaris-equipped missile-launching submarines in 1962-63. A start is expected to be made with six satellites and with them it is hoped to obtain a "fix" accurate to within one-tenth of a mile. Present celestial navigation methods are accurate to between half a mile and a mile.

The U.S.A.F. is also reported to be watching the outcome of the experiments with more than usual interest in view of the possibility of enhancing the launching accuracy of aircraft equipped to carry Skybolt ballistic missiles.

Although the first Transit satellite to enter orbit successfully on Apr. 13 did not contain a memory system for storing and rebroadcasting data obtained from ground tracking stations, which is the basis of the operational system, measurements of its radio signals did, in fact, provide "fixes" on land with accuracies of about a quarter of a mile. Although the latest Transit satellite is still some way from an operational vehicle, it is expected to give even better results. It differs from the first in being powered only by a solar battery, instead of a combination of solar and chemical batteries, and it also carries an electronic digital clock. The latter provides a highly accurate time standard available in different parts of the World at the same instant—a very necessary feature.

The second of the two satellites launched by Able-Star weighs 42 lb. and is intended for measuring solar radiation.

Orbital characteristics of the two satellites launched on Jne. 22 are as follows: the orbit is inclined at about 65° to the equator, which takes the vehicles over the greater part of the Earth's land mass; the orbital period is 101.5 min., with an apogee of 563 miles and a perigee of 460 miles. The smaller satellite, having separated, is travelling just ahead of its companion. At the time of writing, both are working well.

Although this was the first successful demonstration of the double-satellite technique, it is worth mentioning that an attempt was made with Vanguard SLV-5 on Apr. 13, 1959, to launch a 23.3-lb. satellite equipped to map the Earth's magnetic field and an inflatable satellite of 30 in. diameter contained in the same payload. The second-stage of the Vanguard developed a fault and the satellites did not go into orbit.

A Bigger Hovercraft

FURTHER steps in the development of the Hovercraft were in the news last week with an announcement of plans for a much larger craft. According to Hovercraft Developments, Ltd., this project—known as the SR-N2—will be a multi-engined vehicle designed for a wide variety of operational tasks and capable of carrying up to 68 passengers. It will weigh some 25 tons and have a design speed of 70 knots.

This announcement also made it clear, for the first time since Saunders-Roe was taken over by Westland Aircraft, that the collaboration between Hovercraft Developments and the team at Cowes on work of this sort would be continued. The statement also discloses that design and model testing has been going on "for some time" at Westland on a private venture basis. Construction of the SR-N2—which will be a joint Westland Aircraft/Hovercraft Developments venture—is already under way at Cowes.

This arrangement suggests that the new Hovercraft will not be entirely financed from public funds, as was the case with the SR-N1. (Hovercraft Developments, Ltd., for whom it was built under contract by Saunders-Roe, is a subsidiary of the National Research and Development Corporation.)

No details of the SR-N2 are forthcoming but Mr. Cockerell, the inventor of the Hovercraft, has already spoken of a 30-ton craft with a speed of 70 knots, measuring 65 ft. by 30 ft. and having an installed power of 3,750 h.p. Undoubtedly any new project of this sort would be turbine powered and there has already been mention by the Blackburn team of the suitability of their A.129 Nimbus as a shaft turbine engine for use in cushion-riding vehicles. Four such engines—presumably as a buried installation—would seem to meet the power requirement of a craft of the size mentioned.

Independent Combine

BRITISH UNITED AIRWAYS comes officially into existence today, Jly. 1, and the eight principal constituent operators finally lose their identity in the new combine.

Only three companies retain their present names and individuality—Airwork Services, Ltd., at Hurn; Aviation Traders (Engineering), Ltd., at Southend; and Channel Air Bridge, Ltd., which operates vehicle-ferry and passenger services between Southend and the Continent. These three are, however, wholly owned subsidiaries of British United.

The eight lost names cover a period of air transport history totalling some 110 operating years. They include Airwork itself, which was formed in 1928, Air Charter, Airwork Helicopters (previously Fison-Airwork), Bristow Helicopters, Hunting-Clan Air Transport, Morton Air Services, Olley Air Service and Transair. The changes are sad—but presumably inevitable in this era of giant undertakings.

British United will be broken down into an Air Transport Division (fixed wing) and a Helicopter Division, under Mr. F. A. Laker and Mr. A. E. Bristow, respectively, who are members of the board of the new company. Other directors are Mr. M. D. N. Wyatt (chairman), Sir Nicholas Cayzer (deputy chairman), Mr. R. C. Benbow, Mr. Anthony Cayzer, R. L. Cumming (secretary), Mr. P. B. Guinness, Mr. L. Clive Hunting, Mr. T. W. Morton (overseas contracts), Mr. G. N. A. Murrant, Lord Poole, Mr. B. R. Seton-Winton, Mr. J. A. Thompson and Mr. G. H. Trott. Mr. T. L. E. B. Guinness is president. The general manager of the Air Transport Division is Mr. Peter Lewindon.

Shareholding proportions in the new company are Blue Star (20%), Furness, Withy and Co. (20%), the British and Commonwealth Shipping Group (16%), Clan Line (16%), Mr. T. L. E. B. Guinness (10%), the Hunting Group (8%) and Whitehall Securities and others (10%). The fixed-wing fleet of 52 aircraft includes four Britannias, two DC-6As, 11 Viscounts, four DC-4s and 13 Bristol 170s. The main operations base will be Gatwick, but Channel Air Bridge will, of course, continue to operate from Southend and helicopters will be based at Redhill.

Stretched Herald?

SOUTH AMERICAN interest in the Handley Page Dart Herald has reached the point at which the intention of airlines to purchase a minimum of 16 has been announced by the makers. There is also a possibility that a special stretched-fuselage version may be developed for this market. If these orders materialize, say Handley Page, the Herald may be assembled and eventually manufactured in Brazil.

The countries primarily concerned are Brazil and Argentina. Viacao Aerea Sao Paulo S.A. (VASP) is expected to sign a contract for the supply of seven Heralds as an initial programme of replacement for its 13 DC-3s and 15 Scandias.

Other Brazilian operators and the Brazilian Air Force are interested in a version of the Herald with a longer fuselage. This variant would have maximum gross weight of 41,000 lb.

Matters of Moment . . . .

The Cushioncraft in Action

FIRST impressions of the Britten-Norman Cushioncraft, gained during its public demonstration debut at Bembridge last week, were of a thoroughly practical and workmanlike job and an ingenious approach to the many problems involved in developing such a radical vehicle. The demonstrations were of necessity brief and restricted to indoor hovering; and it is not possible on so short an acquaintance of the craft to assess its stability in extended and unrestricted flight. In point of fact, to date the Cushioncraft has not been put in full forward motion, nor has it done more than a number of short preliminary hoverings. Nevertheless it gives every indication, even at this early stage, of being a most promising development.

One particularly noticeable feature was the comparatively innocuous "slipstream" coming from its peripheral fan. This was certainly nothing like so powerful as one had exepected and may perhaps be due to the relatively low cushion-pressure generated by the large diameter rotor. This may well prove to be advantageous in avoiding possible ground erosion problems and in minimising spray effects when "flying" over water.

Another noteworthy point which underlines the essential simplicity of the Cushioncraft is that it has been designed and built in about nine months. And the choice of a wooden basic structure has resulted in a low first cost and weight without any apparent penalty in strength and sturdiness.

As we explained in our article on the Cushioncraft last week, the Britten-Norman approach to the problem has been to use a 40-bladed peripheral rotor to provide the necessary air curtain direct and without lengthy ducting and consequent losses. The team claims that this particular arrangement also shows to advantage on the score of overall efficiency; not only does the rotor itself contribute a reasonable amount of lift, there is a measurable lift component from the outer lip of the annular air intake. The rotor speed is 290 r.p.m. which gives a tip speed of the order of 240 ft. per sec. Power is provided by a 170 b.h.p. Coventry Climax automobile engine and the rotor is friction-driven via an automobile wheel bearing on a track on top of the inner rim of the rotor.

According to Elders and Fyffes, for whom this prototype has been built, the air-cushion-riding type of vehicle has great potential value as a means of transport in their banana plantations in the Southern Cameroons. Apparently, one major problem is the bruising suffered by the fruit during lorry transport from plantation to boat. The smooth passage of a cushion-rider over roughly prepared tracks would prevent this and in the long run save a considerable amount of money.

Such a craft is, of course, also capable of operating in conditions in which normal road and water-borne transport is halted. Mud in the rainy season and dried-up river beds in the dry season are no obstacle to a cushion-rider.

This first Cushioncraft is intended as an experimental vehicle with which to explore the possibilities. When its tests at Bembridge are completed it is to be shipped to the Cameroons for "on the spot" investigations. For the purpose envisaged by Elders and Fyffes, vehicles capable of carrying a 10-ton load might well be required; and the Britten-Norman Cushioncraft is expected to provide some valuable lessons upon which to base such future designs.

A Date to Note

NEXT week, on Jly. 8, the Royal Aeronautical Society's Astronautics and Guided Flight Section is to have a lecture from an eminent American astronautical specialist. Capt. R. F. Freitag, U.S.N., Astronautics Officer of the Navy Department's Bureau of Naval Weapons, in Washington, is to present a paper dealing with "The U.S. Space and Astronautics Programme."

This is a subject on which Capt. Freitag can speak with authority, for he has been closely concerned with guided missiles and associated developments since 1945. Among his responsibilities since that date has been the direction and establishment of the basic range instrumentation system for the Atlantic missile range at Cape Canaveral. He has been head of the Ballistic Missile Branch of the Bureau of Aeronautics in the Navy Dept.; project officer on the Jupiter and Polaris missiles and the Vanguard Earth satellite; and planning officer at the headquarters of the Pacific missile range at Point Mugu. And last year Capt. Freitag was awarded the U.S. Legion of Merit for his work in connection with America's naval and national guided missile programmes from 1949 to 1959.

At the time of going to press no synopsis of Capt. Freitag's paper was available, but there can be little doubt that what he has to say will be of considerable interest. With so much going on in this particular direction on the other side of the Atlantic at the present time, it is good to have the opportunity of hearing an up-to-date and authoritative account.

Aviation in Parliament

BRITISH space research—no definite news yet; Ministry of Aviation delegations to the U.S.—to review schedules under the Bermuda agreement; the Bloodhound missile; Blue Steel; and the mobility of the strategic reserve; were among subjects which figured in Parliament last week.

Space research.—Mr. Sandys, replying to Mr. Wyatt (Lab., Bosworth) was unable to make any further statement, but he referred to Press statements saying that the U.S. Government were against the development of Blue Streak as a satellite-launcher because it would mean divulging secrets developed in Atlas. He had read these reports, said Mr. Sandys, but this was all he knew about it; there had been no contact between the British and U.S. Governments on this issue. The first thing was to decide whether it was thought right to go ahead, and then they could face any difficulties.

U.S. visit.—The purpose of the visit of M.o.A. delegations to the U.S. was to review the schedules of air routes operated by U.K. and U.S. airlines under the Bermuda agreement, Mr. Sandys told Mr. Strauss (Lab., Vauxhall). Although considerable progress

USAFETE AERIENNE
THE USAF's 7544TH SUPPORT GROUP ORGANIZED AN ARMED FORCES DAY FLYING DISPLAY AT THEIR HQ AT TOUL ROSIERES IN EAST FRANCE, ON JUNE 19.
THE ALL-MOVING, ALL-NOISE INTERNATIONAL SPECTACLE WAS OPENED BY —
"DAMMIT - SOMEBODY MOVED"
CAPT. JOHN STAVAST, WHO TOOK A PHOTO OF THE CROWD FROM 500 FT. AT 500 KNOTS IN HIS RF-101
FOUR CF-100's OF 419 MOOSE SQN R.C.A.F. FLEW AROUND VERY SEDATELY —
"THINKS SHADES OF ZURAKOWSKI!"
DURING THE USAAF's SKYBLAZERS' SHOW, THEIR SPEEDY F-100's COULD ALWAYS BE HEARD — AND QUITE FREQUENTLY SEEN
IN THE "CENTURY SERIES" FLYPAST, THE F-104 FLEW SO CLOSE TO THE F-100 THAT IT WAS GETTING RE-HEAT AT BOTH ENDS
THAT OTHER, SLIGHTLY SLOWER, MEMBER OF THE CENTURY SERIES, THE C-130, IS SPECIALLY SHAPED TO COPE WITH ITS AMAZING TAKE-OFF.
"MUST BE AMERICAN M.P.H."
Col JACK BLACKWELL Asst Director of Ops., 66th Tac Recce Wing, who flew with
Sqn Ldr PETER LATHAM O.C. 111 Sqn in the Hunter F.7 "Lead Ship"
U.S.A.F
R.Belgian A.F
R.A.F
Capt. PAT KRAMER Leader "SKYBLAZERS" (4+1 F-100's)
Maj ROBERT BLADT Leader "RED DEVILS" (4 HUNTERS)
Flt Lt "CHAS" BOYER Leader TREBLE-ONE BLUE SECTION (5 HUNTERS)
THE BELGIAN TEAM CALL THIS "THREAD-THE-NEEDLE" MANOEUVRE THE "WHOOMPH" — IT JUST SOUNDS LIKE THAT, THEY SAY

was made, it was not found possible to reach full agreement. The remaining points outstanding were being considered by the Government. A draft agreement on traffic in the Caribbean area was reached, and he had suggested to the U.S. Government that that agreement should be put into effect without waiting for other outstanding matters to be settled.

Bloodhound.—About £45m. has been spent in developing and proving the various Marks of Bloodhound and their directly associated radars, Mr. Rippon (Parliamentary Secretary, M.o.A.) told Mr. Altaun (Lab., Salford E.). It would not be in the public interest to give the production expenditure since this would enable an estimate to be made of the numbers on order. An advanced version is being developed which will offer important advantages in range, height and speed over that now in service.

Blue Steel.—It was, said Mr. Sandys, when questioned by Mr. Wyatt on whether Blue Steel was to continue after 1965, a very good rule to leave foreign intelligence services to do their own work.

Strategic reserve mobility.—Air mobility of the strategic reserve is already considerable, as recent exercises have clearly shown; and this mobility is increasing as more Britannias enter service, Mr. Watkinson (Minister of Defence) told Mr. G. de Freitas (Lab., Lincoln).

Sailplane Symposium

THE Technical Sessions of the 8th OSTIV Congress in Cologne covered three days of lectures (Jne. 9, 10 and 11) and three earlier sessions on Standard Class Airworthiness problems. Although the printed programme shows 39 papers, only 31 were delivered including an extra unscheduled lecture. The lectures were distributed nationally as follows: Germany, eight; the United Kingdom and the United States, four each; France, three; Austria, Italy and Poland, two each; Canada, Finland, Holland, Hungary, Yugoslavia and Russia, one each. Of the cancellations and "no-shows," four were Polish, two French, one German and one American.

Outstanding among the papers was that by Puck of Darmstadt who described a number of highly developed sailplane structures in glass-fibre laminates in some cases supported by impregnated paper honeycomb. These developments were backed financially by government and private funds and the results are most impressive.

Two papers dealt with the application of electronic computers to sailplane problems. Merklein used a digital computer for producing a succession of polynomials to fit a mass of experimental data derived from performance tests. Piero Morelli used an analogue computer in a study of dynamic longitudinal stability with fixed and free controls over a wide range of centre of gravity locations.

The two flight performance papers by the late August Raspet and Gyorgyfalvy were outstanding in their careful analysis of the drag of full-scale sailplanes in flight and will be widely used by designers.

As sailplanes become faster, and quicker control response is demanded, the flutter problem becomes more important. Two papers, by Bergh and Bojanowski, were given and the problem was also discussed in the Working Group on Standard Class Airworthiness. As usual airworthiness received special attention in papers by Vernon, Cijan and Sandauer.

For the first time for some years, training methods were given an airing, encouraged by a paper by R. Kunz on two-seater training. This was included in the OSTIV Congress in an endeavour to give designers some assistance in design requirements for modern trainers.

As higher sailplane performance becomes more and more difficult to achieve, much more careful analysis of formerly somewhat neglected aspects of design become necessary. The problem of producing a permanent wrinkle-free and wave-free wing surface without undue weight and cost is still with us (Puck, R. Kunz, Wortmann). Tailplane shapes, proportions and sections now merit greater study (Matteson). Closer study of stability and response is progressing (Zacher, Gedeon, P. Morelli, Schneider). Operational refinements were also discussed (Eppler, Siencnik, Davey, Gowin, Mironov Brital and Golubkov).

Development problems of new sailplane types received some attention (Kunz: "Austria," Brohocki's new tailless BKB-1). But no straightforward type descriptions having no special developmental aspects were given, as they are more suitable for the OSTIV book "The World's Sailplanes" the second volume of which is being prepared.

The difficulty with OSTIV Congresses is that since this organisation has only honorary staff and not much money, it cannot afford any kind of translation service. A lecturer may use English, German or French and the discussion of any lecture may involve all three of them. German and English (often more or less broken) are used more than French (four out of 31 this time were in French).

Apparently most Frenchmen speak only French and most Englishmen and Americans only English. North, south and east of the Rhine English and German are standard intercommunication languages. Thus such countries tend to gain more than we do from such a congress—which is a shame, considering the sound technical ideas and data emanating from it. The French gain least of all.

The Congress lectures will gradually appear in Swiss Aero Revue and, in due course, will finally be bound as OSTIV Publication No. 6.—B.S.S.

Retiring from the Bristol Board

AFTER a close association with the Bristol Aeroplane Company of more than 30 years' standing, Capt. K. J. G. Bartlett, C.B.E., A.F.R.Ae.S., M.Inst.T., M.S.A.E., retired from the board on June 30. An energetic enthusiast for the cause of British aviation and a very strong protagonist of Anglo-French co-operation, Ken Bartlett has been a familiar figure on the aeronautical scene on both sides of the Channel for a long time. We understand, however, that he will not entirely sever his connections with the Bristol organization, for he is to continue to represent the company's interests as a member of the board of its French associate SECA—Société d'Exploitation et de Constructions Aéronautiques—and as vice-president of Bristol's Spanish associate TABSA—Talleres Aeronauticos de Barajas S.A. He is also president for 1960-61 of the British Chamber of Commerce in France.

Born in 1893 in Belgium, where he received his education, Ken Bartlett saw service in the Army in the First World War—in which he attained the rank of captain—and remained in the Service until 1920. The following year he became manager of the motorcycle section of the French Gnôme et Rhône company and from 1923 to 1927 was a director of Marelli Magnetos in Belgium. Naturally enough, having such close ties with the Continent, after joining the Bristol company in 1928 he became its European representative with his headquarters in Paris. From then until the war he became an indefatigable traveller and his efforts did much to assist the export of British aeronautical equipment in the pre-war years.

Upon the outbreak of war he joined the Royal Air Force and became liaison officer with the British and French Air Forces. And for his good work during this period he was subsequently made a Chevalier of the French Legion of Honour—receiving his decoration at a special investiture at the French Air Ministry in 1949.

After the fall of France Ken Bartlett returned to England and was released from the R.A.F. to rejoin the Bristol organization and become manager of its engine repair section. On Feb. 22, 1943, he was appointed to the board of the Bristol Aeroplane Company and two years later was made sales director—a post he held until 1953.

To his efforts during this latter period is owed much of the success of the Bristol Freighter as a utilitarian work-horse used for all sorts of tasks all over the World in large numbers. In his sales campaign for this remarkable aeroplane he personally covered more than 60,000 miles in Freighters on sales and demonstration tours.

In 1950 his ties with the Continent were further strengthened by his appointment as vice-president and treasurer of the Fédération Aéronautique Internationale. Later he became its president from 1954 to 1955.

Another important task to which he turned his inexhaustible store of energy and experience was the deputy chairmanship of the European Purchasing Commission—a post for which he was "loaned" by the Bristol Aeroplane Company to the Ministry of Supply in 1951. And in 1953 Capt. K. J. G. Bartlett's name was in the New Year Honours list as having been appointed a Commander of the Order of the British Empire.

Seven years ago when Ken Bartlett retired from his post as Bristol's sales director, C. G. Grey wrote of him that to think that he was 60 years of age and had done 25 years with the Bristol company came as a bit of a shock. A month or so ago Ken Bartlett was to be seen at the Louis Blériot Lecture in Paris as enthusiastic and energetic as ever; and it was just as hard then to believe that he had had such a long association with international aeronautical affairs.—F.I.M.

Aviation News in General

MOUSE-SHOT.—Al Knight, a 17-year-old "rocketeer" of Winter Haven, Florida, claims to have launched a home-built, two-stage, solid-rocket to a height of five miles with a mouse as the payload. Both rocket stages including the mouse—were recovered safely by parachutes, Knight says.

BIG BANG.—A Washington report suggests that space researchers will attempt to explode a quarter of a ton of cynamite suspended from a 300-ft. balloon high over the United States next spring. Object is to discover the effect of setting off high-explosives some 25 to 30 miles above the Earth.

LETHAL FLARES?—Level of radiation from solar flares can be sufficiently intense as to be a potential hazard to manned space-travel, according to data received from Pioneer V.

D.6 DELIVERED.—The first Auster D.6/160 was delivered recently to a Norwegian owner. Registered LN-BWB, it is similar to the Auster J/5V G-APUW, already described in THE AEROPLANE AND ASTRONAUTICS, but has metal wing spars. The first D.6/180, with the 180 h.p. Lycoming engine and C.S. propeller, will be completed at the end of this month.

ALOUETTE ORDERS.—Five S.E. Alouette IIs have been ordered by the Peruvian Government, which has been using one for aerial surveys since 1957. Two Alouettes have also recently been sold to Cambodia.

HERON DEAL.—The 12 Herons operated by Garuda Indonesian Airlines have been sold to the Japanese firm of C. Itoh and Co. Three are to be resold to Japan Air Service and two to TOA Air Ways. Three others will be exported after overhaul to Cambodia and two to Australia.

JETSTAR ORDER.—Five Lockheed T-40 JetStars have been ordered by the U.S.A.F. for the Airways and Air Communications Service to make inspections of World-wide military navigational aids. It is the first military order for the JetStar, which was designed for the official UCX competition; it is already in production at Marietta for executive and business use.

PROTEUS LIFE.—Overhaul life of the Bristol Siddeley Proteus in the Bristol Britannia has been extended by the A.R.B. from 2,000 hr. to 2,400 hr.

OVERHAUL HOURS.—Inter-overhaul periods for the JT-3C and JT-4A have been increased, to 1,200 hr. and 1,000 hr. respectively, by the F.A.A. The U.S.A.F. now has a 1,400-hr. period for its J57s in B-52s and KC-135s.

BIG DROP.—The A.O.C. of the recently formed No. 38 (Transport Support) Group, A.V.M. Peter Wykeham, planned to make a trial parachute descent last Tuesday, Jne. 28. He invited senior members of his H.Q. staff to join him in a drop from a Pioneer C.C.1 into Lyme Bay, Dorset. They were to be followed by 30 R.A.F. parachute jumping instructors and Royal Marines and S.A.S. paratroops jumping from a Hastings.

PICK-A-BACK.—Full-size demonstration model of the double satellite launched by a two-stage Able-Star rocket on Jne. 22. A description appears on page 2.

LUTON CEREMONY.—Mr. Duncan Sandys will inaugurate the new concrete runway and Customs facilities at Luton Airport on Jly. 8.

SHEFFIELD HELIPORT.—The parking space in the centre of the new £700,000 wholesale market at Acres Hill, Sheffield, is to be used as a helicopter landing ground.

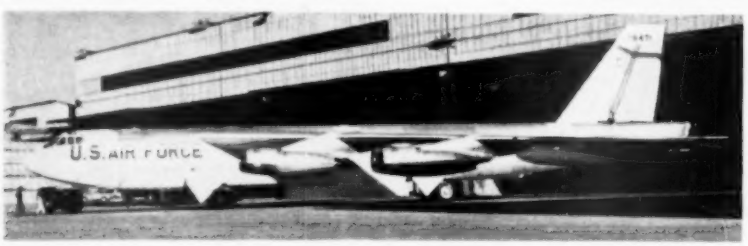
BRISTOL SERVICE.—The Aviation Services Division of Bristol Aero-Industries, Ltd., in Canada has signed a contract to provide ramp handling services for K.L.M. at Montreal Airport. Similar services are provided at Montreal, Toronto and Winnipeg for various airlines including B.O.A.C., C.P.A. and Air France. Mr. K. L. Marshall has recently been appointed general manager of the division.

SARAH ORDER.—A £14,000 order for SARAH beacon equipment has been placed with Ultra Electronics, Ltd., by Flight Refuelling, Ltd., for use in the recovery of cameras in drone aircraft. Bristol Aerojet, Ltd., have ordered SARAH for missile test vehicle recovery, and a small number are to be supplied to the R.A.E. for a similar purpose.

A.O.A. CONFERENCE.—This year's two-day conference of the Aerodrome Owners' Association will be held at Folkestone on Oct. 11 and 12.

LIQUID OXYGEN ORDERS.—Short Brothers and Harland have chosen the twin 25-litre liquid oxygen (LOX) breathing system for the Britannic. Eleven sets of this equipment will be required. This follows the initial order placed with British Oxygen Aviation Services by Sir W. G. Armstrong Whitworth Aircraft for 20 sets of the 25-litre LOX system for the A.W.660. A 25-litre LOX assembly, full, weighs 102 lb., while the gas cylinders required to give the same amount of oxygen weigh 401 lb

BULGING BEECH.—This Beechcraft L-23, a U.S. Army version of the Twin Bonanza, is one of several being used for evaluation of airborne surveillance radar—in this case the AN/UPD-1 set.



FAN FORT.—To fly this month, this B-52G is to be used to obtain flight experience with the TF-33-P-1 turbofan engines which will power production models of the B-52H due for delivery from the Wichita production line later this year.

Commercial Aviation Affairs

ANOTHER COMET.—B.E.A. last week increased its order for Comet 4Bs from nine to 10. This is the third repeat Comet order by the Corporation, which originally ordered six in August, 1957. Fifty-one Comet 4s, 4Bs and 4Cs are now in service or on order.

MORE CARAVELLES. — Repeat orders for nine Caravelles were announced last week by Sud-Aviation. They are from Air France for three (total 27); Alitalia for four (total eight); and Air Algérie for two (total six). The grand total of Caravelle orders is now 91.

NIPPON EQUIPMENT.—All Nippon Airways has leased from Vickers two 52-seat Viscount 744s which were originally used by Capital Airlines before delivery of the full quantity of 745s. The lease is for one year from May, 1960, pending delivery of three Viscount 810s and three F-27s next spring and summer. All Nippon Airways' re-equipment plans for the next three years are said to involve 10 Viscounts and 20 F-27s.

ANOTHER CAPITAL RESPITE.—The deadline for Capital's reply to Vickers' foreclosure suit has been further extended, to Jly. 11. The company has also been given permission to make interest payments due on Jly. 1 on its outstanding debentures, on condition that the interest payments owing to Vickers are brought up to date on Jne. 30.

S.A.A. BOEINGS.—Accommodation in the South African Airways Boeing 707s will be for 125 passengers including 32 first-class; crews will total 11 including senior captain, co-captain, first officer, navigator, flight engineer, radio operator, chief flight steward, senior flight steward, two stewards and a travel hostess. The three aircraft will be named "Johannesburg," "Cape Town" and "Durban." Services between South Africa and London will begin in October.

TURBOFAN FIRST.—First flight of the turbofan-powered Boeing 707-120B was made from Renton on Jne. 22. This aircraft will be used for certification of the "B" model. Subsequently, the 24 American Airlines' 120s will be converted to this standard with 17,000-lb. s.t. JT-3D turbofans, centre wing "glove," leading-edge flaps and taller fins.

MERGER PROTEST.—National Airlines has protested to the C.A.B. that the proposed acquisition of Convair 880s by Northeast Airlines and associated $9.5 million loan (see our issue for May 27) would give Howard Hughes illegal control of the latter company. An investigation of the transaction and of the proposed Northeast-T.W.A. merger is requested by National.

PERSIAN LINK.—Persian Air Services inaugurated an international service on Jne. 20 with three services a week between Teheran and Europe. Operated by DC-7Cs, two of these flights are on the route Teheran-Geneva-Brussels, one continuing to London, and the third from Teheran to Paris and London.

ARLANDA IN USE. — The first scheduled service was operated through Arlanda, Stockholm's new airport, on Jne. 23 when the S.A.S. DC-8 service from New York arrived. Since December, Arlanda has been in use for crew training flights.

SKYWAYS SERVICE.—The £6 15s. fare for day return and 24-hour no passport trips to Paris, mentioned in our issue of Jne. 17, applies from London and not from Lympne. These tickets are available only on Saturdays and Sundays, but 48-hour tickets from London are available any day of the week.

CRASH AT RIO.—A Convair liner of REAL S.A. Transportes Aeros on a flight from Brasilia to Rio de Janeiro, crashed into Guanabara Bay on Jne. 24. It had been unable to land at Santos Dumont Airport because of fog and rain. All 46 passengers and five crew were killed. It was the 21st accident this year involving passenger fatalities; over 500 passengers and 80 crew members have been killed.

News About People

BOARD APPOINTMENT. — Mr. Harold Bamberg, chairman of the Eagle group of companies and of Sir Henry Lunn, Ltd., the travel agents, has been elected to the boards of Cunard Steam-Ship Company and Cunard White Star.

LEGAL HONOUR.—Prof. John Cobb Cooper, Professor Emeritus of International Air Law at McGill University, Montreal, has been awarded an honorary doctorate in laws by Princeton University, where he graduated. He is legal adviser to Pan American Airways and IATA, and a pioneer in air law and space law. (A letter from him on the subject of airspace problems appears on page 24).

R.-R. APPOINTMENTS.—New senior appointments were announced by Rolls-Royce last week at their Derby and Scottish factories. At Derby, Mr. F. O. Thornton has been appointed assistant general manager and Mr. F. Straw assistant general works manager. In Scotland, Mr. P. I. J. Brabrook and Mr. H. Lawson have been appointed assistant general managers (Scottish factories).

F.A.A. APPOINTMENT.—Mr. John V. Tighe has been appointed special assistant to the administrator of the Federal Aviation Agency. He served for eight years with National Air Transport and United Air Lines before joining the U.S. Department of Commerce in 1936.

NOEL MONKS. — We regret to announce the death on June 18 of Noel Monks, well-known Services correspondent for the *Daily Mail*, and recently Court correspondent at Buckingham Palace. He was 52.

SIR MAURICE BONHAM-CARTER.—We regret to record the death in London on Jne. 7, of Sir Maurice Bonham-Carter, K.C.B., K.C.V.O., at the age of 79. Sir Maurice was chairman of General Aircraft, Ltd., and remained as a member of the board when that company was merged with Blackburn Aircraft; he was a director of Blackburn and General Aircraft from 1952 to 1957.

HERALDIC.—The Hon. George Ward, Sec. of State for Air (second from left) who recently flew in the Handley Page Herald, is seen here with Silver City pilot Capt. R. Shilton, H.P. director Mr. E. Manley Walker and Northolt Station Commander Gp. Capt. G. P. Harger.

Air Transport

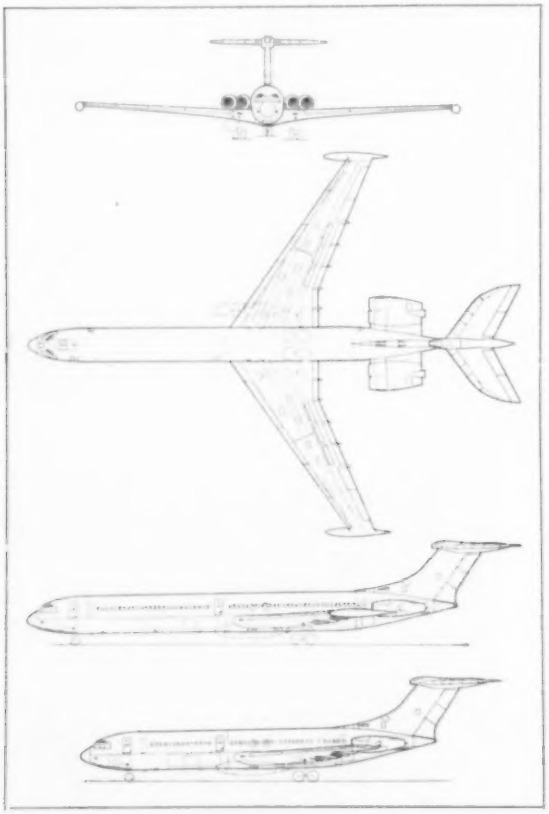
Super VC10s for B.O.A.C.

A CONTRACT for 10 Vickers Super VC10s was signed by B.O.A.C. last week. Details of this "stretched" version of the VC10 were first given in our issue for Feb. 12 and were amplified on Apr. 1. The order is the largest placed with the British aircraft industry since the recent regrouping and is the first major contract received by the British Aircraft Corporation, of which Vickers-Armstrongs (Aircraft) is a subsidiary.

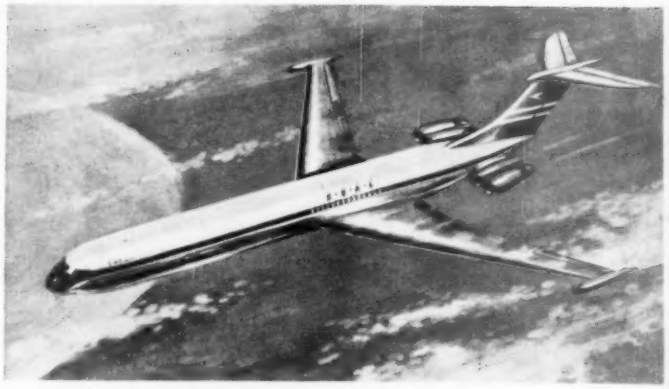
The Super VC10, as the illustrations show, differs from the original version—of which B.O.A.C. will receive 35—in having a fuselage lengthened by 28 ft. and wing-tip fuel tanks of 750 Imp. gal. capacity each. There will be some structural stiffening and the engines will be Rolls-Royce Conway 42/2s. The philosophy behind this particular member of the VC10 family is to take advantage of the runway lengths available at the ends of the World's trunk routes—and especially that over the North Atlantic.

For use on B.O.A.C. Empire routes, the original VC10 was designed to lift large payloads out of medium-length runways, the rear-engined layout and consequently "clean" wing being of vital significance in this context. Where runway length is not limiting, it follows that the VC10 could be operated at much greater weights, and the Super VC10 takes advantage of this to provide accommodation for as many as 62 more passengers than the standard version. The maximum take-off weight is increased from 299,000 lb. to 347,000 lb.

Other weights and dimensions which have changed (with the standard VC10 figures in brackets) are: landing weight, 241,000 lb. (197,500 lb.); zero fuel weight, 219,000 lb. (176,500 lb.); max. payload, 58,000 lb. (38,000 lb.); max. fuel weight 150,000 lb. (138,000 lb.); wing span, 146 ft. (140 ft.); overall length, 186 ft. (158 ft. 10 in.); overall cabin length, 118 ft. (91 ft. 4 in.);



The Super VC10 is compared here with the standard aircraft (bottom view). Of the 28-ft. fuselage extension, 20 ft. is forward of the wing and 8 ft. is between the wing and tail.



and underfloor cargo space, 2,000 cu. ft. (1,350 cu. ft.). As an example of performance, the Super VC10 will carry its 58,000-lb. payload for 3,500 naut. miles with fuel for one hour's stand-off and 200-mile diversion, in still air and in I.S.A. conditions.

Maximum seating in the Super VC10 will be for 212 passengers in economy class, six abreast. The B.O.A.C. aircraft will seat up to 187 for the North Atlantic routes, with six-abreast seating, two galleys, seven passenger toilets and a crew toilet. Another typical mixed-class layout seats 50 first-class and 111 economy-class.

Deliveries of the Super VC10 will begin to B.O.A.C. early in 1965, following upon the 35 VC10s which will be delivered from June, 1963, onwards. Commenting on the order, Sir Gerard d'Erlanger said that it completes B.O.A.C.'s current aircraft fleet requirements and brings the value of the Corporation's investment in British aircraft to £214 million since 1949. Over half this sum is accounted for by the VC10s; by the end of 1959 the contractual commitment in respect of the first 35 VC10s alone was £95 million. The latest order is valued at some £25 million without spares.

Sir George Edwards last week described the VC10 and Super VC10 as complementary. "Together," he said, "they cater economically and competitively for the long-haul networks. Traffic on the North Atlantic route is growing rapidly under the impetus of economy fares and special payment terms. The capacity of the Super VC10 is a recognition of this fact. . . . In our view, and this view is shared by B.O.A.C., there will be a continuing World need for a large and economical subsonic jet for many years to come. This applies not only to high-traffic routes, but to all trunk services."

L.A.P.'s Traffic Problem

THE first of the really heavy (and inevitable) passenger jams at London Airport's north-side terminal was recorded on Jne. 20. Nine long-haul aeroplanes—seven of them from North Atlantic flights—landed within a period of about 30 minutes and more than 500 passengers had to be cleared through Customs. They did their best, but the buildings were filled to capacity.

That this kind of situation was bound to arise had been seen quite clearly three or more years ago when the full extent of the airlines' turbojet orders was known. It was obvious not only that these big-capacity units would bring an increase in the numbers of passengers which had to be handled together, but that there would be occasions when weather and other circumstances would cause a number of them to arrive more or less at the same time.

Plans for a long-haul building in the central area were outlined as long ago as 1955 or earlier, but four more years went by before they were finalized and work started. The reasons for the delay were numerous. It was natural that a great deal of thought and discussion had to be applied to ensure that the building, when finally planned and completed, would be adequate for the future traffic and practical in use.

In the circumstances, the delays can perhaps be accepted as being inevitable to our way of life—but not, surely, the

(*Continued on page 9*)

44

AIRLINES HAVE CHOSEN . . . VISCOUNT

All Nippon Airways of Tokyo — three Viscount 810's ordered! Ghana Airways — three also! This now makes forty-four airlines with Viscounts in service or on order, as listed opposite. Five Governments and seven private companies or individuals also operate Viscounts.

22

HAVE RE-ORDERED . . . VISCOUNT

Of these forty-four airlines, twenty-two have now placed repeat orders for Viscounts.

2,500,000

HOURS HAVE BEEN FLOWN BY . . . VISCOUNT

This is the impressive total of hours flown by Viscounts in airline service.

EUROPE
British European Airways
Air France
Aer Lingus
K.L.M.
Lufthansa
Alitalia
Austrian Airlines
Turkish Airlines
Airwork
Hunting Clan Air Transport
Tradair
Transair
Eagle Aviation
Icelandair

NORTH AMERICA
Capital Airlines
Continental Airlines
Northeast Airlines
Trans-Canada Air Lines
Maritime Central Airways

CENTRAL AND SOUTH AMERICA AND CARIBBEAN
Vasp (Brazil)
Pluna (Uruguay)
L.A.V. (Venezuela)

VISCOUNT
FOUR ROLLS-ROYCE DART TURBO-PROP ENGINES

Lloyd Aereo Colombiano
TACA (El Salvador)
British West Indian Airways
Cubana

MIDDLE EAST
Middle East Airlines
Misrair (Egypt)
Iraqi Airways
Iranian Airways
Kuwait Airways

AFRICA
Central African Airways
Sudan Airways
South African Airways
Ghana Airways

SOUTH EAST ASIA
Indian Airlines Corporation
Pakistan International Air Lines
Union of Burma Airways
Malayan Airways

AUSTRALASIA
Trans-Australia Airlines
Ansett-A.N.A.
New Zealand National Airlines Corporation

PACIFIC
Philippine Air Lines
All Nippon Airways

VICKERS-ARMSTRONGS (AIRCRAFT) LIMITED WEYBRIDGE SURREY

MEMBER COMPANY OF BRITISH AIRCRAFT CORPORATION

VGA AT6 59

D

TO DATE 368 SUCCESSFUL ESCAPES

have been made using

MARTIN-BAKER EJECTION SEATS

The result of 16 years experience and more than 850 test ejections.

MARTIN-BAKER

Air Transport . . . .

(*Continued from page 8*)

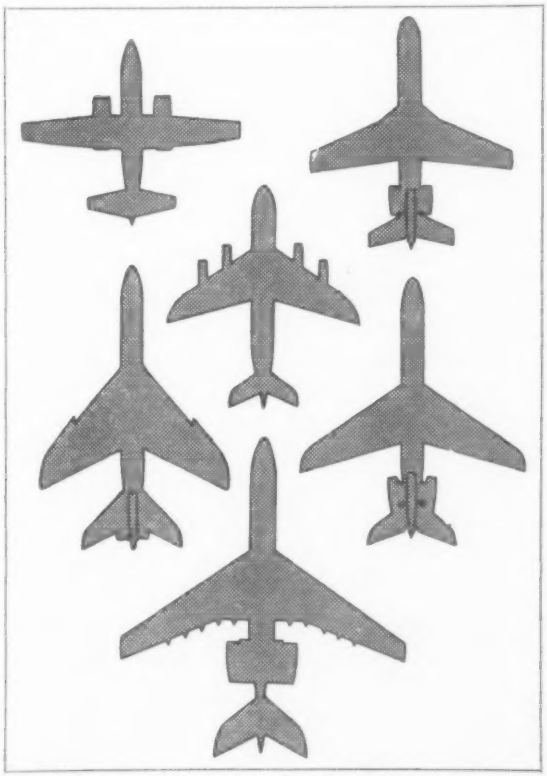
failure to make adequate temporary arrangements for the handling of the additional traffic which was so obviously impending. It must have been known two years ago that the central area extensions were unlikely to be available for use before 1961; that was the moment for accepting the delay and recognizing the need to do something about the existing north side accommodation.

The first half of the new long-haul building will not be available until the second half of next year and completion is not planned until mid-1962. Would it not be advisable to do a little interim jerry-building on the north side site—which, after all, is not quite the slum which people sometimes pretend it to be? These 15-year-old "temporary" buildings are quite cosy—their only real trouble is that they are too small and there are too few of them.

B.E.A. Plugs the Gap

STARTING today, Jly. 1, B.E.A. is to operate its most intense service ever on the London-Paris route with 15 return flights a day at an average frequency of one an hour between 08.00 hrs. and 20.00 hrs. This service is in place of that planned for the Vanguard which, had it not been for the engine fault discovered in May, would have been going into operation today. The plan had been to use three Vanguards for seven London-Paris round trips a day, with one late-night tourist flight by Viscount.

In order to provide the necessary capacity on the Paris route, B.E.A. has leased two Viscount 779s from Fred Olsen until the end of the summer, and has made two other Viscounts available from its own fleet by withdrawing them from other operations. They, in turn, will be partially replaced by a Dan-Air Elizabethan which will fly four B.E.A. services a week to Jersey. In addition, two Dan-Air Yorks will take over some of B.E.A.'s freighting and so release Viscount crews. Although B.E.A. had not actually taken delivery of a Vanguard when flying was stopped, most of the crews required for the first three aircraft had completed all but the base and route flying parts of their conversion programme. These crews have had to be converted back on to Viscounts.



A PROGRESSION.—Some stages in the project development of the Vickers VC10 are illustrated here. From left to right, top to bottom, are a jet Viscount (May 1956) with four Nenes; Vanguard fuselage with Valiant outer wings and three Avons; Vanguard fuselage with four B.E.47s; Vanguard fuselage with Scimitar wing form and three Avons; Vanjet (Oct. 1956) with three Conways; and VC10.

The total number of seats now offered between London and Paris each day is in fact rather higher than would have been the case with the Vanguard service. The Vanguards are laid out for 26 first-class and 84 tourist-class passengers and would have provided 770 seats a day each way, in addition to the single 58-seat Viscount service. The Viscounts alone will provide about 900 seats each way, the actual total depending on the types of Viscount used on the route each day. Only the 19 B.E.A. Viscount 806s have mixed class accommodation (16F/42T) however, and to retain operational flexibility B.E.A. has decided to make the London-Paris service all-tourist and uncatered. Thus the potential extra revenue from 182 first-class seats each way in the Vanguard will be lost to B.E.A.

Apart from the mixed-class Viscount 806s, the B.E.A. fleet includes 20 Viscount 802s, which can carry up to 71 tourist passengers each and 23 Viscount 701s of which about six are 61-seaters and the others 52-seaters. The two Fred Olsen 779s (which have been flying until recently with Austrian Airlines) also have 52 seats.

All first-class passengers who had booked before the Vanguard delay became apparent will receive, at the time they travel, a letter from Mr. A. H. Milward explaining the reasons for the change of plan. Refunds will be made but no pre-advice will be given individually.

No further news is available from Rolls-Royce of the investigation into the Tyne compressor fault, but we understand some Vanguard flying may soon be resumed. The aircraft concerned would be Vickers' own Vanguard, G-AOYW, and the first for T.C.A., and they would use engines cleared for development flying only, following a special check by Rolls-Royce.

70,000 Caravelle Flights

IMMERSED in the 350,000-cu.-ft. water tank at the Etablissement Aéronautique de Toulouse, the fatigue-test specimen of the Caravelle has now completed 70,000 simulated flights, representing at least 30 years of typical airline service. Some details of the test programme, which is continuing with no sign of the endurance limit being neared, have been given by Sud-Aviation.

For the first 20,000 "flights," a 3-minute cycle was used to represent a 3 hr. flight, and 250 flights were simulated during a 12 hr. 30 min. period on four nights each week. In the day following each of the first three of these periods, an airline-type 750-hr. inspection was made, to discover at the earliest possible moment any signs of damage. The fourth period each week was followed by a 3-day inspection representing the 3,000-hr. check. A detailed major inspection was made every 5,000 hr., lasting two weeks and involving the dismantling of components.

For the next 17,000 "flights," a 1½-min. cycle (1hr. 30 min.-flight) was used, doubling the number of representative flights in each night of testing. Inspection remained at the same hours-flown intervals, the periods between inspection therefore being doubled in terms of flights made and approximating more closely to the maintenance conditions for aircraft operating over short stages. Subsequent to the 37,000th "flight," a 1 hr. flight was represented by a one-minute cycle, thus trebling the original intervals between inspections. This allowed for the maximum likely delay between the advent of possible damage and its detection. By the time the 70,000th cycle was reached (on Mar. 31), no serious failure was evident and instances of damage detected continued to be dealt with under the normal maintenance applicable to an operating aircraft.

Throughout the test programme, static peak loads of 1.15 times the safe load have been applied regularly—at first after each 500 cycles and eventually after each 1,500 cycles. At the same time, the cabin pressure differential was raised to 12.8 p.s.i.

March, 1960, also saw the anniversary of the first Caravelle delivery, made to Air France on Mar. 19, 1959. In these 12 months, Sud-Aviation completed 26 Caravelles and the production rate had reached four a month by February this year. At the end of May, nearly 30,000 hr. had been flown in airline service and more than 20,000 landings made. One of the few difficulties encountered in operation concerned braking on wet runways, which led to several incidents. The introduction of a tail parachute, modifications to the tyres and anti-skid devices and amendment of the landing technique overcame this problem.

Between May and December, 1959, delays exceeding five minutes averaged only seven per 1,000 departures, the length of delay falling progressively from 8% to 5% of the flying hours. Premature engine removal rate has been 0.29 per 1,000 hours.

Air Transport . . . .

New Soviet Equipment

WITH the Tu-104, Il-18 and An-10 medium-range transports all established in service and the long-range Tu-114 in the final stages of route proving, Aeroflot is now turning its attention to new turbine-powered equipment for the shorter stage lengths within Russia. Two new types are under development—one turbojet and one turboprop—and both are believed to be in the preliminary flight-test stage. They are the Tupolev Tu-124 and the Antonov An-24.

Contrary to some early reports which attributed supersonic performance to the Tu-124, this aircraft is now known to be a 46-seater for use on stage lengths up to 1,000 miles, and capable of operating from runways at present used by the piston-engined Il-14s. Said to resemble the Tu-104 in general appearance, the Tu-124 has four Soloviev engines believed to be turbofans. (Soloviev headed the design team responsible for the turbine engines in the massive Mil Mi-6 helicopter). The Tu-124 prototype was completed in December, 1959.

The twin-engined An-24 seats 32-40 passengers and is in the same category as the Herald and Friendship. Photographs appearing in the Russian press show a conventional high-wing monoplane with slim, deep nacelles underslung from the centre section. Twin-wheeled main undercarriage legs retract forwards into these nacelles. The outer panels of the wing appear to have the anhedral which is characteristic of the larger An-10, and the engine nacelles resemble in appearance those of the Ivchenko AI-20s on the Il-18. The engines are of unspecified type, of about 2,000 e.h.p. each.

Designed for 800-1,100 mile stage lengths, the An-24 cruises at 325 m.p.h. at 20,000 ft. and is claimed to have operating costs 25% lower than those of the Il-14.

The Air-freight Business

WITH most of the major U.S. carriers converting a proportion of their big-capacity piston-engined equipment for cargo operations, the situation is beginning to look more than a little insecure for the specialist all-cargo operators. The fact that the conversions are being done—in an effort to squeeze some use out of the outmoded aircraft rather than to lay them up or sell them at present prices—leads inevitably to the assumption that the big "combination" carriers will really begin to hunt for freight business. And, with their nation-wide organizations, they are likely to be better at getting it.

These domestic all-cargo carriers can hardly be said to have done very well financially since, 10 years ago, the C.A.B. granted temporary route certificates to six of them—four of whom (Aaxico, Slick, Flying Tiger and Riddle) still survive, though Slick has not resumed the operation of scheduled services since their suspension in 1958.

Fairly heavy operating losses were returned by this group of operators in 1956, 1957 and 1958, with an overall loss of $4,406 million in 1957. The provisional 1959 figures show a group operating loss which is nearly as high, at $3,594 million, though revenues remain at a healthy level. The actual net losses have not been on quite this scale; non-operating income from the sales or lease of equipment and from other sources has offset the operating losses and, in fact, these all-cargo airlines showed quite a handsome net profit (of $1,822 million) in 1956.

Unlike the "combination" carriers—which were subsidized for many years and which are still eligible for subsidy if a good enough case can be made—the all-cargo operators have not the right to ask for aid. Now, with the big airlines making, or about to make, maximum use of their piston-engined equipment, there seems to be very little hope of a change of heart within the C.A.B. It appears that the all-cargo carriers will find it more difficult now than ever before to make a case for the "public necessity and convenience" of their operations.

Altimeter-misreading Accident

IT has been tacitly understood that the accident to B.O.A.C.'s Britannia 312, G-AOVD, on Dec. 24, 1958, near Hurn Airport, Hants, during a C. of A. test flight, was caused by altimeter misreading. The report of the Accidents Investigation Branch, which was issued last week, confirmed this fact.

The conclusions state that "the captain misread or failed to read the indicated altitude of the aircraft during the concluding stage of the flight" and that "the first officer misread his altimeter by approximately 10,000 ft. too high when reporting the aircraft's altitude to Air Traffic Control at 11.35 and 11.53 hrs." The aircraft flew into fog-obscured ground.

Following representations made on behalf of the two pilots (one of whom, the first officer, survived the accident), the Chief Inspector of Accidents added the following comment: "The height presentation afforded by the type of three-pointer altimeter fitted to the subject aircraft was such that a higher degree of attention was required to interpret it accurately than is desirable in so vital an instrument. This, when taken in conjunction with the nature of the flight on which the aircraft was engaged, was a contributory factor."

The three-pointer altimeter was of a modified type introduced by B.O.A.C. as a result of Comet 1 experience. In this the 10,000-ft. pointer had been extended to the outside scale so that it could not become totally obscured by the other pointers. Following an earlier incident caused by altimeter misreading the Corporation's Flight Operations Department had issued an order on May 22, 1958, requiring the captain and co-pilot to cross-check their altimeters at 20,000 ft. and 10,000 ft. during climbs and descents.

The test flight with the Britannia, which had taken off from L.A.P. at 10.10 hrs., included a three-engined climb to 18,000 ft., a high-speed dive lasting for about a minute, stall tests in various configurations and a protracted series of rate-of-roll checks during a 500-ft./min. descent. After completion of further functional checks the aircraft was flown towards Hurn Airport and at 11.53 hrs. the first officer reported that they were overhead at 12,000 ft., VMC on top, and asked for IMC descent clearance to 3,000 ft. The descent was started at about 11.55 hrs. and the ground was struck at about 11.58 hrs.

The British Airline Pilots' Association is "profoundly disturbed" by the placing of full responsibility for altimeter-misreading on the pilots and considers that the accident was "largely design induced and cannot justifiably be ascribed to a failure of the pilots properly to carry out their duties." "If," the BALPA statement also comments, "a three-pointer altimeter of the type in question *is* misread some proportion of the blame must attach to those responsible not only for fitting the instrument in the first place, but for continuing to fit it after its ambiguity was proved, and also to the regulatory authorities who approved the instrument as being fit for the purpose."

Nevertheless, it seems to us that in pressing the case for rejecting a "pilot error" finding it must not be overstressed. In this particular instance, the circumstances were not those of an emergency and the error—however understandable—was in fact instrumentally recognizable, even though, as the report says, this required an undesirably high degree of attention.

NEW PRESCRIPTION.—The six de Havilland Drovers used by the Royal Flying Doctor Service are being re-engined with 180-h.p. Lycoming O-360-A1A engines, providing 40% more power and improved performance. The first such Drover Mk. 3 was handed over at Bankstown early last month.

Curtiss-Wright's Flat-Risers

A RANGE of VTOL projects has been announced by Curtiss-Wright in addition to its tilting-propeller research aircraft, the Model X-100, illustrated in the issue of April 29, p. 535, and the VZ-7AP aerial jeep for the U.S. Army.

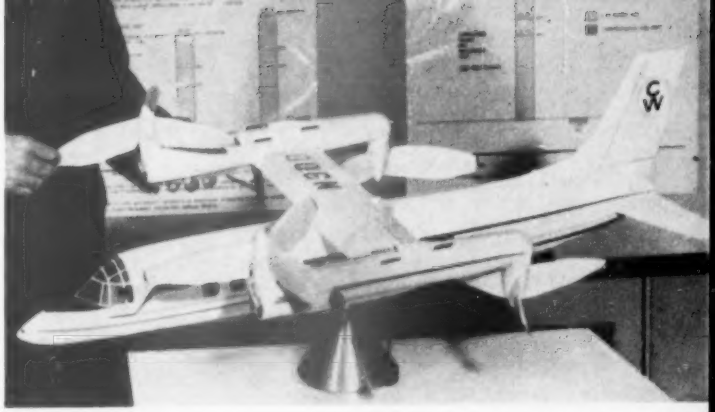
The Model X-100 and the new projects have what are referred to as "radial lift force" propellers. Curtiss-Wright claims that these produce a lift force during forward flight when they are revolving in a plane perpendicular to the line of flight; no details are given as to how this is achieved. For vertical take-off and landing the propeller axis is revolved vertically through 90° so that the propellers act as helicopter rotors.

This type of propeller is to be used on the Model 200, a six-seat VTOL executive aircraft which the company is designing; it will be powered by a Wankel-type engine. Another project, illustrated on this page, is the Model 300 which is a VTOL local-service transport.

The VZ-7AP has been developed by the Santa Barbara Division of Curtiss-Wright (formerly Aerophysics Development Corp.) under a U.S. Army Transportation Corps contract. Other "aerial jeeps" for the U.S. Army are being developed by Piasecki and Chrysler.

Of four-rotor configuration, the VZ-7AP is powered by a 425-s.h.p. Artouste IIB shaft-turbine engine. It has a dry weight of about 1,700 lb. and a useful load of about 555 lb. Performance details are not available.

The two-bladed rotors, or "rotor-props," of the VZ-7AP are shaft-driven; they are hinged to allow both vertical and horizontal flapping. The pairs of left- and right-hand rotors revolve in opposite directions and their pitch can be altered both collectively and differentially to control the craft. Automatic stabilization is incorporated in the control system.



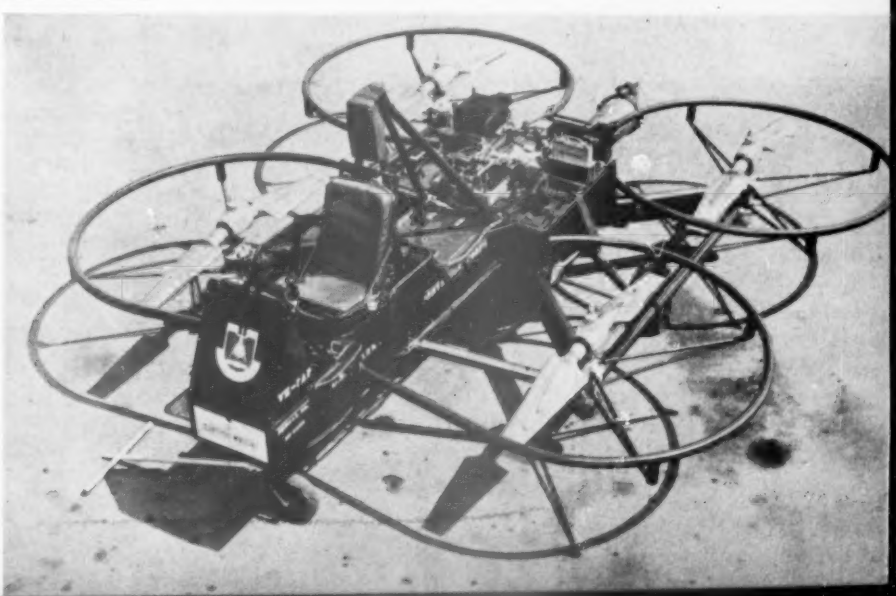
NOVEL LAYOUT.—Both the tractor and pusher "radial-lift" propellers of the projected Curtiss-Wright Model 300 transport swivel to give VTOL performance. This local-service transport is designed to carry 30-50 passengers.

Yaw control is by vanes under the rotors which are swivelled by normal foot-operated rudder pedals. Additional yaw control is provided by a rudder in the jet efflux, the thrust from which contributes to forward propulsion.

Rotor speed is maintained constant at values selected by the pilot, who has two engine controls—a throttle and engine-governor setting selector. As shown, the VZ-7AP has only a single seat, but a second can be fitted and the platform between the rotors can be used for cargo or weapon carrying; a recoil-less rifle has been carried by the craft.

UNDERCARRIAGE.—The fixed tricycle undercarriage of the VZ-7AP has a castoring nose wheel; the main wheels have hydraulic brakes for steering and to hold the vehicle during ground running.

ARMAMENT.—As shown above, a recoil-less rifle can be mounted on the VZ-7AP.



FOUR ROTORS.—Guard rails round the rotors of the VZ-7AP aerial jeep have been removed for flight tests of the vehicle.

The Fighting Services

No. 17 Squadron Standard

MARSHAL OF THE R.A.F. SIR DERMOT BOYLE is to present the Standard to No. 17 Squadron at R.A.F. Wildenrath, Germany, on Jly. 12. A former member of the Squadron, Sir Dermot was posted to the unit, then stationed at R.A.F. Hawkinge, from Cranwell nearly 30 years ago.

No. 17 Squadron was formed at Gosport in February, 1915, leaving for Egypt later that year. Its first operational sorties were ground attack and reconnaissance missions in support of ground forces during the battle which saw the defeat of the Sultan of Derfur. In July, 1916, the Squadron moved to Greece, where it was engaged in hard fighting until the Armistice. In November, 1919, it was disbanded, re-forming in April, 1924, again as a fighter squadron.

After the outbreak of the Second World War, its Hurricanes undertook air defence duties in No. 11 Group, and later took part in operations over France, in the withdrawal from Dunkirk, and in the Battle of Britain. In November, 1941, it was moved to Burma for operations against the Japanese. During the next two years it was employed on air defence in India and offensive sweeps over the Arakan. Later the Squadron was withdrawn to Ceylon, where it re-equipped with Spitfires.

In November, 1944, it returned to the Burma front to operate in support of the 4th Corps driving towards Rangoon. After the Japanese surrender, No. 17 Squadron was based in Malaya until March, 1945, when it was transferred to Japan, remaining there until disbandment in February, 1948. The Squadron re-formed as an Army anti-aircraft co-operation unit in 1949, disbanding once more in March, 1951. It again re-formed in June, 1956, at Wahn in Germany, as a photographic reconnaissance squadron, later moving to its present base at Wildenrath.

New Technical Training Commandant

AIR COMMODORE M. K. D. PORTER, C.B., C.B.E., has been appointed Commandant of No. 4 School of Technical Training, R.A.F. St. Athan. Joining the Service in 1928 as an aircraft apprentice, he received his early training at Halton and was awarded a cadetship to Cranwell in 1930.

Senior Technical Officer at Headquarters, No. 205 Group, in Egypt between 1950-52, Air Cdre. Porter commanded No. 2 Air Signallers School at Halfpenny Green until 1953, when he was appointed C.O. of No. 1 Air Signallers School at Swanton Morley. He served as Chief Signals Officer with 2nd T.A.F. in Germany, later becoming Chief Signals Officer at Headquarters, Fighter Command.

No. 209 Squadron Honoured

THE Federation of Malaya has presented a kris to No. 209 Squadron, based at Seletar, Singapore, to commemorate the Squadron's help in the Malayan Emergency which is to end in July. Presentation of the sword—a traditional weapon in South East Asia—was made by the Malayan Defence Minister and Deputy Premier, Tun Abdul Razak, to the C.O. of No. 209, Sqn. Ldr. J. Cartwright.

No. 209 Squadron (which was renumbered from No. 267 Squadron) flew over 4,000 sorties in and out of the jungle in support of security forces, using single-engined Pioneers, in the seven years ending last month when they ceased to operate from Kuala Lumpur and relinquished their rôle to the R. Malayan A.F. In addition the Squadron, when it was amalgamated with No. 205, undertook over 360 strikes with Sunderlands.

A breakdown of the Pioneer activity shows the aircraft flew 16,100 hours over the jungles of Malaya, carrying 17,300 troops, 12,100 passengers, 3,449,000 lb. of freight and evacuated 500 casualties.

HOT-WEATHER TRIALS.—A new pattern cockpit sun shelter is now being used for the Operation "Swifter" Canberras at R.A.F. El Adem, Libya. It is mounted on castors and is pulled clear when the aircraft is ready to taxi.

R.A.F. Appointments

THE following are among recent Royal Air Force appointments:—

Air Ministry: Wg. Cdr. J. C. Forbes, D.F.M., and Sqn. Ldr. R. W. Jordan, D.F.C., to the Department of the Chief of the Air Staff, the latter with acting rank of Wg. Cdr.; Wg. Cdr. G. F. McMahon, D.F.M., and Sqn. Ldr. W. J. Parham, M.B.E., both to the Department of the Air Member for Supply and Organization, the latter with acting rank of Wg. Cdr.

Bomber Command: Wg. Cdr. H. M. Chinnery, M.V.O., A.F.C., to R.A.F. Wittering, to command No. 138 Squadron; Wg. Cdr. H. S. Grimsey, O.B.E., D.F.C., A.F.C., to R.A.F. Waddington to command the Administrative Wing; Sqn. Ldr. A. B. Ellender to R.A.F. Scampton as Senior Technical Officer with acting rank of Wg. Cdr.

Transport Command: Wg. Cdr. M. Mays to R.A.F. Lyneham, to command the Flying Wing; Sqn. Ldr. A. L. Baker to R.A.F. Colerne as Senior Technical Officer with acting rank of Wg. Cdr.

Flying Training Command: Gp. Capt. I. C. K. Swales, D.S.O., D.F.C., D.F.M., to Headquarters, No. 23 Group, as Senior Officer (Administration); Wg. Cdr. A. McArthy to Headquarters, No. 25 Group, as Senior Technical Staff Officer; Sqn. Ldr. A. D. Jillings to Headquarters for navigation duties, with acting rank of Wg. Cdr.

Maintenance Command: Wg. Cdr. E. G. Alcock, A.F.C., to the R.A.F. Staff College, Andover, for directing Staff duties; Wg. Cdr. J. B. A. Fleming, O.B.E., to Boscombe Down to command the R.A.F. Unit.

R.A.F. Germany: Gp. Capt. B. Barthold, O.B.E., to R.A.F. Wildenrath, to command; Wg. Cdr. I. Whittaker, D.F.C., to R.A.F. Bruggen, as Senior Technical Officer; Wg. Cdr. A. Boonham to R.A.F. Butzweilerhof to command No. 5 Signals Unit; Wg. Cdr. T. Knight, O.B.E., to Headquarters for operations duties.

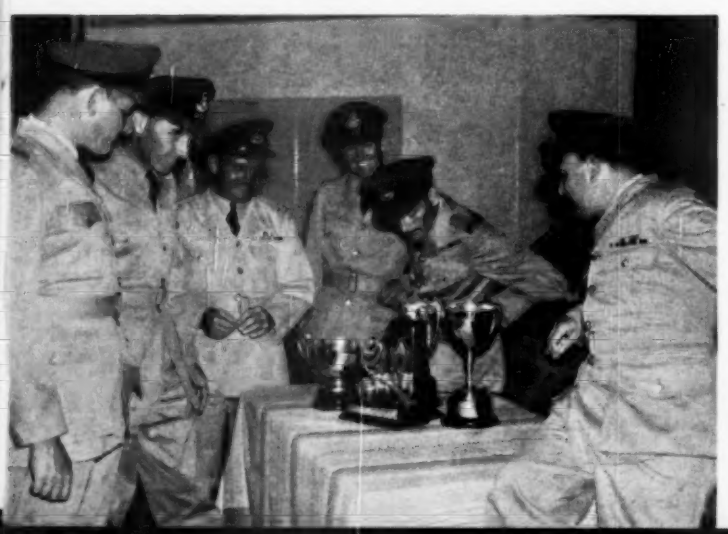
Middle East Air Force: Wg. Cdr. A. F. Wallace, O.B.E., D.F.C., and Wg. Cdr. A. J. Picknett, D.F.C., both to Headquarters, the former as Gp. Capt. (Organization) with acting rank of Gp. Capt. and the latter for operations duties; Sqn. Ldr. A. A. Stewart, M.C., R.A.F. Regiment, to R.A.F., Akrotiri, Cyprus, to command No. 27 (Light Anti-Aircraft) Squadron.

Other Appointments: Gp. Capt. L. D. Dadswell on exchange posting to the U.S.A.F. for R.A.F. Liaison duties; Gp. Capt. F. F. Rainsford, C.B.E., D.F.C., to the R.N. Staff College, Greenwich, for directing staff duties; Wg. Cdr. G. M. McMinn, M.A., to Washington for Ministry of Defence duties.

More Service News

Coastal Command.—Air Marshal Sir Edward Chilton, A.O.C.-in-C., Coastal Command, visited No. 1 Maritime Headquarters Unit, R.Aux.A.F., at Northwood last month. After addressing the officers, airmen and airwomen, the A.O.C.-in-C., presented the C.O., Wg. Cdr. A. R. Poole, D.S.O., D.F.C., R.Aux. A.F., with a Coastal Command unit badge.

Service Gliding Championships.—This year's R.A.F. Inter-Command Gliding Championships are being held at Odiham from Jly. 16 to 22. These will be immediately followed, from Jly. 23 to 31, by the second annual Inter-Service Individual and Team Gliding Championships. For the first time, only pilots holding Silver "C" gliding badges will compete in the Inter-Command Championships.



TROPHY WINNERS.—Officers of No. 1 (Field) Squadron, R.A.F. Regiment, based at El Adem, Libya, with some of the trophies won by their unit during the past year. The awards, which included the Higginson Trophy and the Harris Cup, were presented to the unit recently by Air Marshal Sir William MacDonald, A.O.C.-in-C., M.E.A.F.

Low Fares versus Luxury

by M. J. Hardy

Attracting the Mass Air-travel Market: A Study of the Coach/Air and Rail/Air Services to and from the Continent.

ALTHOUGH the post-war aviation policies of both Tory and Labour Governments have, by limiting the scope of British independent airlines, undoubtedly helped to reduce this country's share of World air traffic in recent years, it can hardly be denied that they have served as an excellent stimulus to the growth of one particular class of traffic—namely, short-haul, low-fare services across the Channel. Denied the opportunity to operate regular, scheduled long-haul services in direct competition with the Corporations, the independents have made a virtue of necessity by very successfully exploiting the possibilities not only of vehicle-ferry services but of coach/air/coach and rail/air/rail services.

Skyways now has on order three Avro 748 twin-Dart DC-3 replacements which the airline hopes to be able to use on its coach/air services from Lympne to Beauvais, Vichy, Montpellier, Lyons, Dijon and Tours. The aircraft may enter service in the summer season of 1961 and Skyways considers the Avro 748 to be "ideally suited" to its expanding pattern of coach/air routes. It is certainly a mark of the maturity and importance which this particular segment of air transport has now attained that the independent airline which introduced this type of service only five years ago was able to order a new British turboprop airliner off the drawing-board especially for such services. Presumably Skyways is confident of being able to obtain the necessary Government approvals to introduce more competitive turboprop equipment while preserving the low-fare nature of these services.

It is intriguing—and not entirely irrelevant—to speculate for a moment on what might have happened had Government policy in the early post-war years permitted the independents to operate long-haul services in partnership with the Corporations, rather as T.A.I. and U.A.T. operate alongside Air France. In such circumstances Silver City might not have felt it worthwhile to develop vehicle-ferry services, nor might Skyways have pioneered the integration of surface and air travel represented by its coach/air/coach services. And European short-haul air transport would certainly have been the poorer as a result.

Cynics may object that, with airport-to-city-centre times what they are, most European air transport consists of coach/air/coach services and indeed there is a good deal of truth in this objection when applied to such routes as London-Paris or London-Amsterdam. But this article describes the "bona fide" services involving the integration of coach or rail and air transport which the British independents have developed, and in which the airports involved do not directly serve the cities where these services originate and terminate.

Skyways was first in this field, its London-Lympne-Beauvais-Paris service starting on Sept. 30, 1955; the company's services are now operated by a subsidiary, Skyways Coach Air. The following summer Silver City entered this field with its "Silver Arrow" service to Paris, operated in association with the French independent Cie. Air Transport, using Bristol Freighters. A second coach/air/rail service under this name, between London, Lydd, Ostend and Brussels, was operated in 1956 and 1957, but was not continued, while Skyways operated a London-Lympne-Antwerp service in 1958 with a coach connection to the Brussels Exhibition. Also discontinued was "The Blue Arrow"—a service operated during 1957 between London, Lydd and Lyons by Dakotas of Air Kruise, whose services were later integrated with those of Silver City.

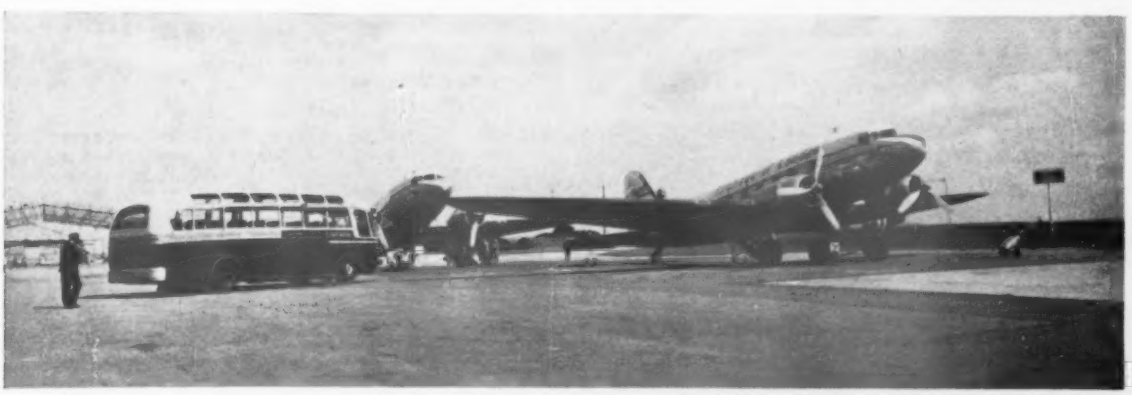
On Apl. 18, 1957, Eagle Airways started "Swiss Eagle" air and rail services to Basle; passengers were flown to Findel Airport, Luxembourg, by Viking and taken on by rail to Basle. A few weeks later, on May 31, a similar seasonal Manchester-Luxembourg-Basle rail/air Viking service was inaugurated. London Airport has now replaced Blackbushe as the U.K. terminal and a separate "Swiss Eagle" from Manchester is not operated, but B.E.A. services from Manchester connect with the London "Swiss Eagle," which is a twice-weekly, seasonal night tourist service. For the record, there was also the "Spanish Eagle," a thrice-weekly service from London to Perpignan in the south-east corner of France, with coach connections over the border to the Costa Brava. The "Spanish Eagle" had to be withdrawn after only 10 flights because permission could not be obtained from the French Government.

Approval Difficulties

Eagle is not alone in having experienced this difficulty, for Channel Airways (East Anglian Flying Services) had planned to inaugurate a coach/air/coach service from London to Paris via Le Touquet in 1958; this had to be cancelled because approval was not forthcoming for the operation of coaches between Le Touquet and Paris. This new service—an extension of the company's Ipswich-Southend-Shoreham-Portsmouth-Le Touquet route—was intended to attract the class of passenger normally carried by rail and the cross-Channel steamers, but the French authorities were adamant in their refusal to grant the coach licence. This deprived Channel Airways of the unique distinction of having operated normal and coach/air services over the same route, since this carrier flies direct to Paris from Rochester, Southend, Shoreham and Portsmouth.

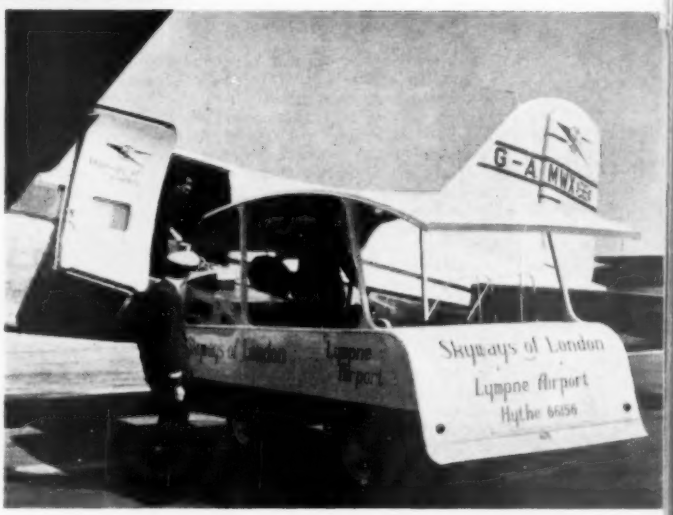
Past BIATA annual reports have, indeed, stressed the fact that the restrictions imposed by foreign governments have retarded the development and wider application of the coach/air and rail/air services; another difficulty is that of obtaining approval for the lower fares offered on these services. The point is also made that foreign-imposed restrictions have, without doubt, resulted in losses to the tourist trade of the countries concerned, and it would appear that, temporarily at any rate, the emphasis will be on the development of existing routes rather than on the introduction of new ones, although Skyways has started new coach/air services to Dijon and Tours this year.

This type of service has now been developed to the extent where it merits the introduction of four-engined, pressurized equipment, and Silver City now operates 68-passenger Handley Page Hermes on the once-daily "Silver Arrow" service between London's Victoria Station, Manston, Le Touquet and the Gare



Coach/air operations are typified in this scene on the apron at Lympne with two of Skyways' DC-3s and the coach which has brought the passengers on part of their journey from London's Victoria Coach Station.

On the left is the passenger lounge at Lympne and below is the interesting apron transport unit designed to simplify loading and unloading and to reduce turn-round times to a minimum.



du Nord in Paris. This service began on Jne. 15 last year, and trains leave Victoria at 8.40 a.m.; a second service, leaving Victoria at 2.40 p.m., operates between Jne. 25 and Sept. 12. Manston has now replaced Lydd as the English terminal, since the former is being used almost to capacity for vehicle-ferry work and the airline has now registered "Railair" as a promotional name. Skyways, incidentally, did apply to the Air Transport Advisory Council to use Manston as an alternative to Lympne for its coach/air services.

Silver City's fame as a vehicle-ferry operator has perhaps rather obscured the success of its coach/air services which, in 1958, carried more than 175,000 passengers to the Continent, the Channel Islands, Isle of Man and Ulster. The "Silver Arrow" services to Paris were originally seasonal and operated only in the peak summer months, but, with the introduction of the Hermes, now operate all the year round. Although seasonal, they transported more than 50,000 passengers during 1956, 1957 and 1958. But Skyways' year-round service to Paris, which is operated at a reduced, but still daily, frequency throughout the winter, had carried its 50,000th passenger in mid-August, 1956—just under a year after the service had started, and this remains easily the most important and popular of Skyways' services in this category.

In terms of volume of traffic Skyways has maintained its initial lead in coach and rail/air transportation, and carries an average of 100,000 passengers a year across the Channel; of these passengers about 25% originate on the Continent. During the 1959 Easter week alone, well over 4,000 passengers were flown to Paris. During 1958, however, largely because French currency and political problems were causing so much trouble, Skyways was fortunate to hold its own. This operator acquired Lympne in 1955 especially for coach/air services, and it was the first British airport outside L.A.P. to have moving belts installed for the conveyance of luggage. Skyways has sought to avoid the "concrete desert" atmosphere of most airports by turning Lympne into a garden airport, complete with its own horticultural specialist.

Background to a Venture

The type of service which Skyways pioneered so successfully is now regarded as almost commonplace, but, when it was first introduced in 1955, it was something of an experiment. Surprisingly enough, the year 1954 was the first in the history of the London-Paris route, which dates back to 1919, in which the British flag carrier (in this case, B.E.A.) was able to show a net profit on that route—a revenue of £1,560,000 being recorded. B.E.A. carried 235,000 passengers between the two capitals in that year, representing 59% of the total traffic, or an increase of 12½% over the 1953 figure. In other words, it had taken 35 years of quality competition, ranging from Imperial Airways' "Silver Wing" services of the late 1920s to the introduction of Viscount turboprops in the early 1950s, to make the London-Paris route a paying proposition. Would a market so long subject to the most sophisticated forms of quality competition show itself responsive to price competition? Would there be any future in a really cheap service between the two capitals taking six or seven hours and operated, not with the glamorous and highly competitive Viscount, but by the homely and obsolete Dakota?

Skyways—and to a lesser extent Silver City—have proved that the answer is an emphatic "Yes," even though the return London-Paris fares offered by these two independents are, in Silver City's case, a mere 10s. lower than the cheapest Air France and B.E.A. night tourist fares of £9 19s. return. Skyways' fares, of £8 5s. (off-peak) and £7 5s. (night tourist) return, are only 34-44s. cheaper than the Air France/B.E.A. night tourist rate, and the latter's day tourist fares are £6 14s. dearer than Skyways' off-peak rate. Skyways' minimum coach/air fare is £6 1s. return for the no-passport day trip from Lympne to Paris, which gives 7½ hours in the centre of Paris. This is the first no-passport day air trip to Paris to be operated.

Appeal to the Purse

Even a £6 saving would hardly be sufficient, one might think, to induce a quality-conscious travelling public, enjoying a high standard of living, to forsake turboprops and turbojets in favour of less modern, slower, smaller and unpressurized aircraft, with a long coach or train ride at each end. These factors result in a total journey time between city centres of 5½ hours for the Skyways' service, of which one hour is spent in the air, and 6-6¾ hours for the "Silver Arrow," of which only 30 min. is spent in the air.

Yet the popularity of these services indicates that their

The Avro 748—the prototype of which is seen here shortly before making its first flight—may be in use on coach/air services next year. Skyways has provisionally ordered three of these twin-Dart feeder-liners.

patrons are price-conscious rather than quality-conscious; very few of them, if any, are likely to be of the "expense account" class of air traveller. These two services seem definitely to have catered for a new class of air traffic rather than diverting traffic from existing services, although, in its 1958-59 report, B.E.A. attributed its 1% decline in traffic between London and Paris to "material diversion of traffic by services operated by British independent airlines."

Skyways' London-Paris coach/air fare is only a shilling or two above the lowest class rail/sea fares—without, of course, the expense of meals, tips and other extras incurred on the rail/sea journey, which is at least two hours longer each way. The demand for such services as these illustrates the fallacy of the argument that speed is the only commodity that air transport has to sell. In offering only a slightly cheaper fare, Skyways, in particular, has succeeded in doing something that is often talked of but more rarely translated into action—namely, tapping the mass-travel markets.

This process, it is worth noting, can stimulate surface travel rather than retard it. The "Silver Arrow" service has been speeded up by tying-in with the electrification of the British Railways' line from Victoria to the Kent coast, the journey from Victoria to Manston via Ramsgate being made in about 2½ hours; in previous years the London-Lydd section of the journey was made by coach. French Railways' high-speed diesel railcars operate non-stop from Le Touquet to Paris, and both the railways concerned are already examining with Silver City the economic feasibility of constructing railway spurs into Manston and Le Touquet. If this is done, the overall journey time should be appreciably reduced.

Skyways' Services

Skyways' Paris services operate at a normal summer frequency of four times a day, with a peak frequency of up to 18 return services a day. For the non-supplementary services coaches leave Victoria Coach Station for Lympne at 5.15 a.m., 6.30 a.m., 12.00 noon and 2.30 p.m., the second service being off-peak, for which the return fare is £1 cheaper, and the first, night tourist with the cheapest fare of all (£7 5s.). A fleet of six 36-passenger Dakotas is used for the Lympne-Beauvais sector; these are fitted with double-strength, half-weight floors specially designed by Skyways. From Beauvais coaches convey the traveller to the Paris terminal at the Moderne Palace Hotel in the Place de la Republique in 1¾ hours—which compares with nearly 3¾ hours for the Le Touquet-Gare du Nord rail journey of the "Silver Arrow." The latter, although an hour or so longer than the Skyways' service in overall time, and slightly less cheap, has the advantage of rather more commodious surface and air accommodation.

Skyways also operates two other seasonal coach/air services until late September on the routes London-Lympne-Vichy-Montpellier and London-Lympne-Lyons-Nice. The former is a nightly tourist service and the latter is a once-weekly service; on both routes supplementary services can be operated on demand, and the maximum Dakota-load is 32 passengers. Total journey time between departure from Victoria Coach Station at 5 p.m. and arrival at the Vichy town terminal, at 23 Rue du Parc, is 6½ hours, of which 2½ hours are airborne; from Vichy the Dakota flies on for a further 2¼ hours to Montpellier. Exactly 8¾ hours after leaving Victoria, the Montpellier town terminal, at 22 Rue de la Republique, is reached. The Vichy and Montpellier service is actually operated by Skyways Coach Air, on behalf of the parent Skyways—which means it is an IATA service. The London-Vichy service has been successfully operated for three years and last year was extended to Montpellier, thus serving the Mediterranean west of Marseilles and giving access to Spain.

Competitive Test

The latest Skyways' coach/air services are to Tours (operated between Jly. 27 and Aug. 31) and Dijon (operated between Jly. 28 and Aug. 25). The former involves a six-hour journey between leaving Victoria Coach Station at 10.45 a.m. and arriving at the Tours town terminal at 5 Rue Berthelot; of this, two hours are spent in the air. The same journey time applies for the Dijon service, leaving Victoria at 11 a.m., and the flight time is also two hours. Both services are flown to a once-weekly schedule with supplementary services operating on demand.

The service to Nice is in competition with Air France and B.E.A. Viscounts, Caravelles, Super Constellations and Comet 4Bs, while on the Paris-Nice sector there is also a wide variety of piston-engined equipment ranging from DC-4s to Starliners. The Comet 4Bs and Caravelles on the Nice-London service will certainly put the "cheapness first" philosophy of Skyways' services to its severest test to date. The scheduled Caravelle and Comet times, of 2 hr. 5 min. and 1¼ hr. respectively between Nice and London Airports, compare with a total Skyways' journey time of 14-16 hours from leaving the Nice town terminal, at Rue Croix de Marbre, to catch the train for Lyons—but, then, the greater part of the journey is taken up by surface transport and the Lyons-Lympne flight takes only 2½ hours.

Comparison between two such different types of service is almost absurd, but it does serve to show that the time difference is compensated for by cheaper fares; the Skyways' 30-day return fare between London and Nice of £24 10s. compares with the cheapest off-peak night tourist fare of £27 offered by B.E.A. and Air France. The standard B.E.A./Air France day tourist fare is £41 12s., and first-class fare is £54 8s.—or more than twice the Skyways figure.

In addition to cheaper fares, Skyways has also arranged a self-drive car service in connection with the French terminals it serves: Paris, Lyons, Nice, Vichy and Montpellier. A car can be collected at any of these points and relinquished, by previous arrangement, at any other, thus allowing those who avail themselves of this facility to enjoy a more mobile holiday.

Above is a typical scene in a DC-3 during a coach/air operation to France. On the right, passengers are boarding the coach for Paris at Beauvais Airport after the flight from Lympne.

NEW WORLD PHOTO-NEWS

Right, the first of five pre-production Umbaugh-18 autogyros has now accumulated eight hours of flight and the second aircraft was due to roll-out early last month. These five craft, as well as all future production models, have a "V" tail, claimed to improve control at low speeds.

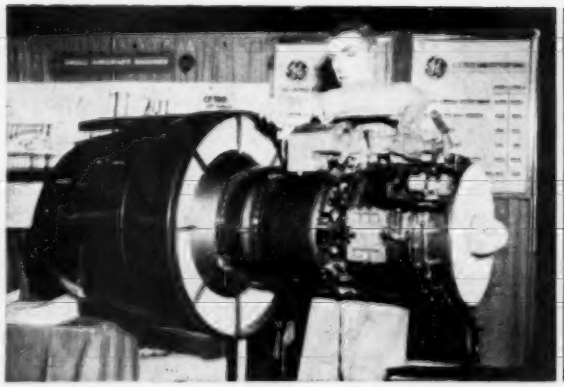
Left, a Lockheed F-104F Starfighter in Luftwaffe markings at Palmdale ready for flight test prior to delivery to the West German Air Force.

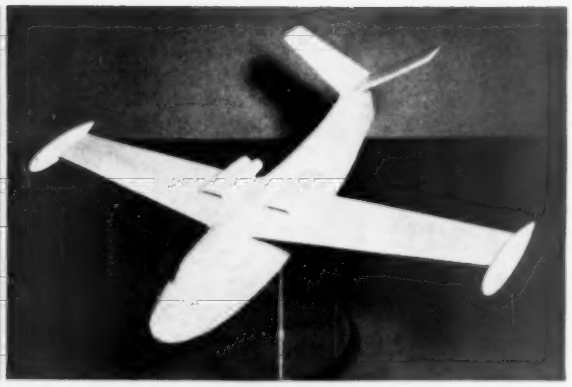
Howard Levy photographs

Right, the first North American T-39A Sabreliner for the U.S.A.F. emerges from the company's paint shop.

Below, first photograph of a full-scale mock-up of the new General Electric CF700-1 aft-turbofan engine with thrust reverser; its thrust has been quoted as 4,000 lb.

A scale model of Aircraft Marine Engineering Co's entry in a U.S. Army competition for a light transport. An amphibian, it will be powered by four Continental 420-M turbofans; its span is 72 ft., gross weight 24,000 lb., and estimated top speed 465 m.p.h.





Atlas as a Space Booster

ALTHOUGH developed primarily as an ICBM, the Convair Atlas is proving of great value to the United States as a satellite launcher. Indeed, the history of this missile shows how much space programmes depend on military developments.

Future U.S. satellite programmes, both military and civil, will lean heavily on the Atlas. NASA, the civil space agency, will use this missile for 104 of the 260 major launchings planned in the next 10 years. Military launchings, particularly of the Midas and Samos early-warning and reconnaissance satellites, will also be made by Atlas.

Atlas can deliver a nuclear warhead over a range of more than 8,000 miles. Its airframe is a stainless steel shell, 10 ft. in diameter. Length of the missile is 82 ft. 6 in. with the Mk. 3 or Series 4 ablative nose-cones, or 75 ft. with the blunt Mk. 2 heat-sink nose-cone. Guidance equipment and batteries are housed in two lateral pods mounted on opposite sides of the tank structure. Take-off weight is approximately 260,000 lb.—more than 90% of which is fuel.

The missile is powered by Rocketdyne liquid-propellent rocket engines—two large boosters, one large sustainer, and a pair of small vernier rockets. All burn RP-1, which is similar to kerosene, and liquid oxygen.

Take-off thrust at sea level is approximately 360,000 lb.; at altitude this increases to well over 400,000 lb. After boost motor separation, the thrust of the sustainer engine alone is more than 80,000 lb. The improved Rocketdyne MA-3 engine, to be introduced soon, will boost take-off thrust at sea level to more than 380,000 lb. With the "1½-stage" system originated by Convair, all engines are ignited on the ground and Atlas flights cannot, therefore, prove abortive because an upper-stage engine fails to ignite in flight.

Booster engines and associated equipment weighing several thousand pounds are jettisoned after about two minutes of flight, and the sustainer continues accelerating the missile until a velocity of about 17,000 m.p.h. is reached. The sustainer then shuts down, the verniers make final velocity adjustments, and the nose-cone is separated from the airframe to follow a ballistic course to the target. Powered flight lasts 5 min.; unpowered ballistic flight continues for 30 min. or more as the nose-cone and airframe climb through outer space in a high arc reaching a height of about 800 miles before re-entry to the atmosphere, where frictional heating destroys the airframe.

During its powered flight the course and speed of Atlas are controlled by its guidance system. Early operational missiles have radio-inertial guidance, which requires a ground station. Later operational versions have an all-inertial guidance system which is contained entirely within the missile. By eliminating the requirement for ground command signals the self-contained all-inertial system makes it possible to launch any number of missiles simultaneously. President Eisenhower said in January that in 15 test launchings at ranges over 5,000 miles, Atlas with the radio-inertial system had been striking on the average within two miles of the target.

Missile Background

In 1946 the U.S.A.F. awarded Convair the first research and development contract in a programme to develop a missile which would carry a warhead 5,000 miles. At that time the only long-range rocket was the 200-mile German V-2. As part of this programme Convair designers under Karel J. Bossart conceived and developed the MX-774 research rocket.

This had three innovations. One was the swivelling of engines for directional control. The second was the use of integral tanks, with the skin of the missile serving as the wall of the propellent tanks; this gave a big weight saving. The third innovation was the use of a separable nose-cone.

U.S. defence economies in 1947 led to the shelving of ICBM development, but Convair was able to complete three of the 10 MX-774s under construction. The first captive firing was made in November, 1947, and complete rockets were launched at White Sands Proving Ground in 1948. From then until early 1951 the company continued limited ICBM studies with its own funds.

ICBM work was revived by the U.S.A.F. on a small scale in January, 1951, and Convair was given a study and development contract. The missile was named "Atlas" that autumn. By 1953 Convair had developed essentially the present Atlas design—pressurized stainless-steel tanks, 1½ staging, vernier trim rockets, gimballed engines, lateral instrument pods and radio-inertial guidance. Construction of the first test tank started that winter.

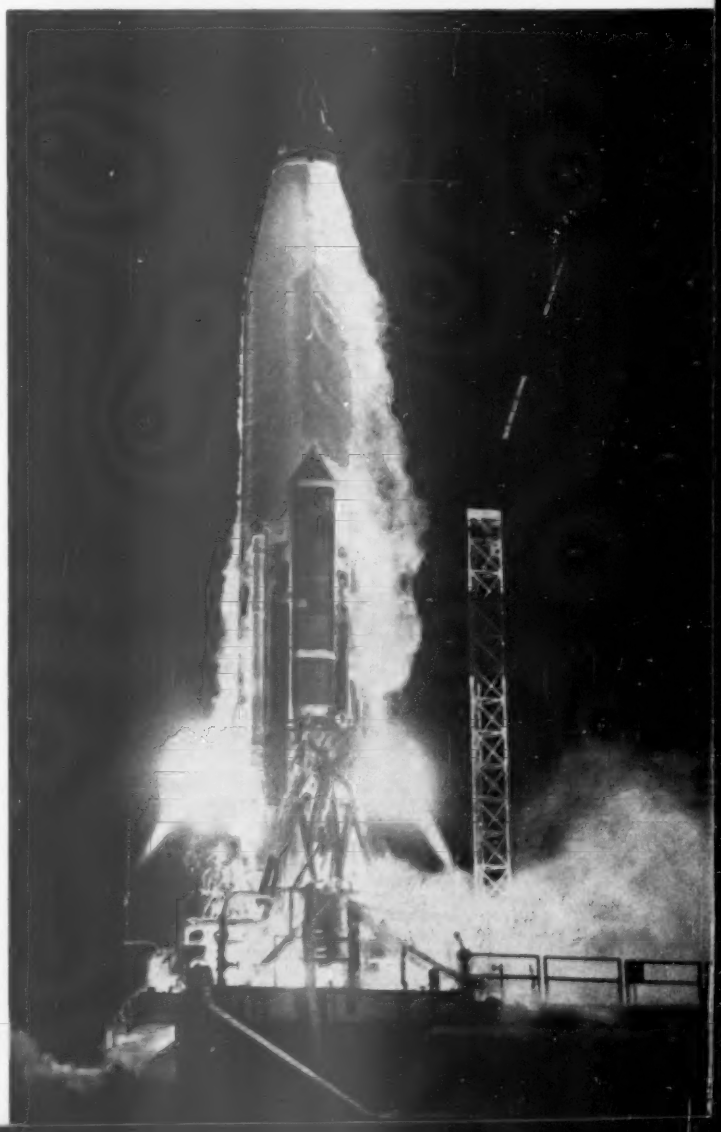
In this original version Atlas was to be powered by five engines developing a take-off thrust of more than 600,000 lb. North American Aviation, which had worked on Atlas propulsion as a sub-contractor, was made a full associate contractor by the Air Force in 1954.

During early 1954 successful testing of small thermonuclear devices (Operation Castle) led the U.S.A.F. to accelerate the ICBM programme. The U.S.A.F. Ballistic Missile Division was created to manage it and Convair received a production contract in January, 1955. The thermonuclear breakthrough allowed the size of the missile to be reduced considerably.

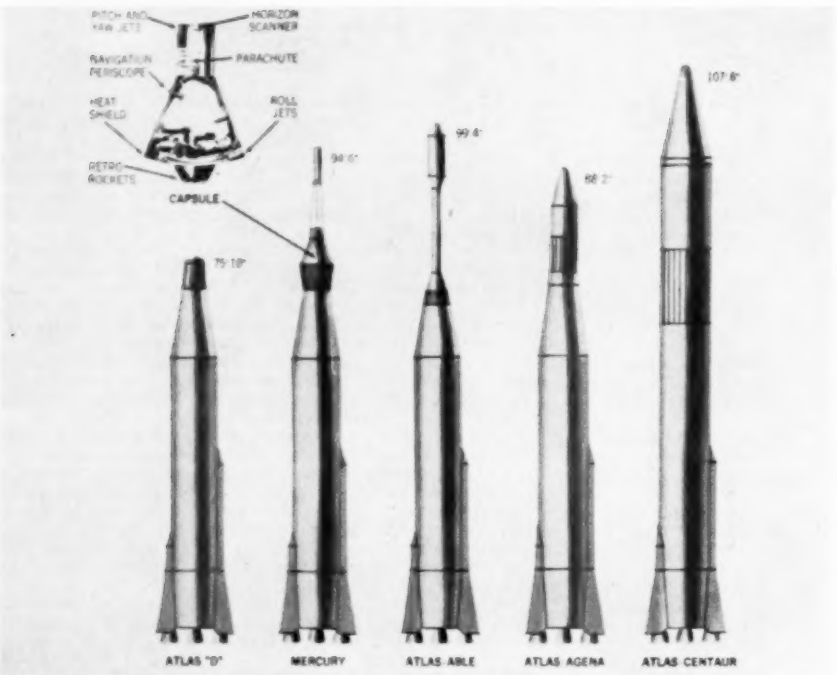
Atlas construction began at San Diego in 1955. First engine tests were conducted at Edwards A.F.B. in June, 1956; the first completed missiles were delivered to Cape Canaveral that autumn.

Flight testing of Atlas started at Cape Canaveral in June, 1957, using Series A missiles fitted with booster engines only and having dummy nose-cones. The range was limited to approximately 600 miles. In eight such flights the missile was launched smoothly and retained complete stability during the vertical climb, but on the first two flights the missiles malfunctioned after starting the turn into their trajectory and were destroyed by the range safety officer. Successful flights were made in December, 1957, and January, 1958.

Testing of the complete missile, the Series B Atlas, with its sustainer engine and separable nose-cone, started in the summer of 1958. A control system failure caused the first to break up



ATLAS INTO ORBIT.—On Dec. 18, 1958—three weeks after an Atlas had been fired from Cape Canaveral over a range of 6,300 miles—Missile 10B was sent into orbit. This impressive picture shows the orbital Atlas being launched.



ATLAS FAMILY.—The basic Atlas Series D on the left is the U.S.A.F. ICBM. In various forms it has been developed also as a space booster. Atlas-Mercury is the manned capsule project; Atlas-Able is a space probe; Atlas-Agena is intended as a general-purpose space vehicle for military and scientific missions; and Atlas-Centaur is America's first high-energy general-purpose space vehicle.

in flight on Jly. 19, 1958. The second was launched successfully on Aug. 2 and attained a range of more than 2,500 miles. Successful longer-range flights followed on Aug. 28 and Sept. 14, achieving all Series B test objectives four months ahead of schedule. A full-range flight of well over 6,000 statute miles was made on Nov. 28. Missile 10-B was fired into orbit on Dec. 18. The first Series C Atlas was launched on Dec. 23 and Series D testing started in the spring of 1959. The first fully successful flight was made on Jly. 28, 1959.

The tempo of flight testing was increased in the second half of 1959, and by the middle of March, 1960, 21 Atlas missiles had been launched in eight months, all of them successfully. The 17th and 18th missiles of this group were fired on the same day, Jan. 24. One was launched by a U.S.A.F. Strategic Air Command crew at Vandenberg A.F.B., the other by a Convair-Astronautics test crew from Cape Canaveral.

Atlas achieved "limited operational capability" in 1959, and the missile force forms part of Strategic Air Command. Its first missile division has headquarters at Vandenberg A.F.B., north of Los Angeles, which is a combined operational and training base. The first Atlas launched by Strategic Air Command was fired from Vandenberg on Sept. 9, 1959.

Thirteen operational squadrons are being formed and are in various stages of planning and construction. The last six will have hardened launch sites and, under an Atlas expansion programme approved by the White House in April, 1960, each of these six squadrons will have 12 launchers instead of the standard nine.

For these "silo" squadrons each missile will be emplaced vertically in a reinforced concrete-lined hole, 52 ft. in diameter and about 175 ft. deep. An elevator raises the missile to the surface a few minutes before launching. In all but the first three Atlas squadrons, launchers are widely dispersed.

Atlas Space Vehicles

Current or projected space programmes involving Atlas or Centaur, a Convair space vehicle derived from the Atlas, are given below:—

Atlas-Mercury. To boost the first U.S. manned capsules into orbit.

Atlas-Able. Atlas combined with two upper stages, to send instrumented probes into lunar or planetary space.

Projects Midas and Samos. To boost the first heavy military satellites into polar orbit, using Atlas with Lockheed's Agena upper stage. Midas is the satellite which will use infra-red techniques to give warning of enemy missile launchings. Samos is the U.S. reconnaissance satellite which was at one time known as Sentry.

NASA Atlas-Agena Series. A major programme of "medium-energy" scientific space shots which will partly take the place of the cancelled Atlas-Vega series.

Atlas-Centaur. First U.S. "high-energy" vehicles, with payloads equivalent to the Russian Lunik series. Atlas will be combined with a Convair-built upper stage which will be powered by the first liquid-hydrogen rockets.

Saturn Payload. Centaur was chosen in 1959 to form the top or payload stage for the multi-stage Saturn vehicle, which is under development for NASA by Dr. Wernher von Braun's Marshall Space Flight Center team.

Convair space studies began in 1952. The first report on the satellite capabilities of the Atlas was published as a classified document in May, 1953. Later that year Convair proposed the use of the Atlas to place a TV-equipped military reconnaissance satellite in polar orbit.

In 1957, after Russia's launching of the first satellite had stirred strong U.S. interest in space, Convair was able to present a comprehensive satellite and space development programme to Government agencies. One recommendation covered the development of an upper-stage rocket powered with liquid hydrogen. This is now under way as Project Centaur.

In a project sponsored by the Advanced Research Projects Agency, Atlas Missile 10-B, the "talking satellite," was launched into orbit from Cape Canaveral on Dec. 18, 1958. Fewer than 100 people knew of this project until President Eisenhower announced two hours later that Atlas was circling the Earth.

Its 122-lb. payload, the largest orbited by any U.S. satellite during the International Geophysical Year, was installed by the Army Signal Corps. It consisted largely of duplicated communications-relay equipment, designed to tape-record voice or code messages transmitted to the satellite and to rebroadcast them upon command from the ground. It broadcast from space a message sent to it by President Eisenhower. Successful experiments continued during the life of the batteries. The satellite is believed to have re-entered on Jan. 21.

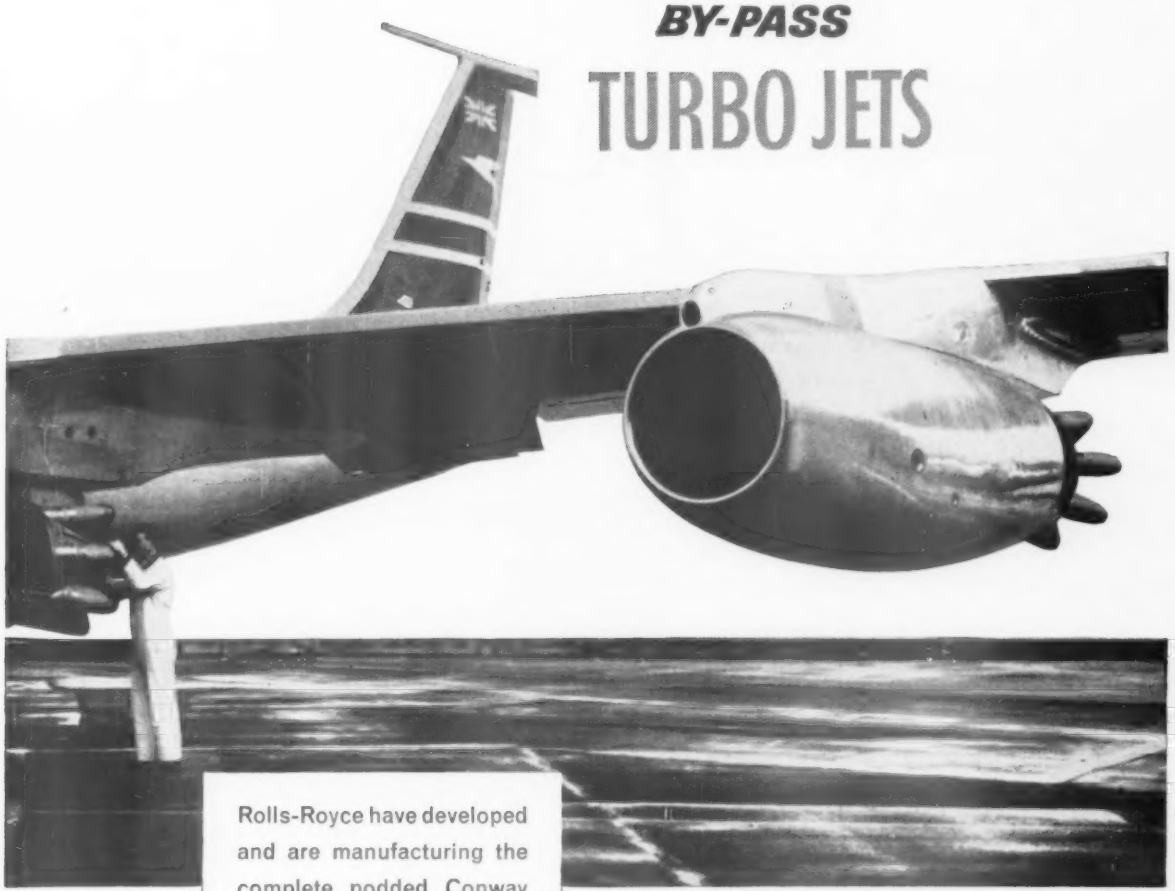
For this launch the take-off weight was approximately 245,000 lb. The booster package was jettisoned normally and the sustainer shut down after some 4½ min. of flight when the velocity was 25,394 ft. per sec. (17,314 m.p.h.) relative to Earth's surface. Initial estimates of the satellite's weight were 8,700-8,800 lb. These were corrected to "not more than 8,661 lb." after detailed analysis; the weight of residual propellents cannot be determined precisely. Its orbit had an initial perigee of 110.6 miles, an apogee of 911 miles, a period of 101 min., and an inclination of 32.3°.

Project Mercury was initiated by NASA in October, 1958, to put the first U.S. manned capsules in orbit. The capsule, which will be boosted into orbit by a Series D Atlas, is under development by the McDonnell Aircraft Corp. Roughly conical in shape, it is approximately 7 ft. across the base and 10 ft. high. A boom carrying emergency escape rockets is fitted above the capsule during launching but is jettisoned as soon as the capsule is safely in orbit.

A special couch-like seat will support the pilot during

(*Continued on page 19*)

ROLLS-ROYCE CONWAY BY-PASS TURBO JETS



Rolls-Royce have developed and are manufacturing the complete podded Conway installation, including the thrust reverser and silencer, for the Boeing 707-420.

CONWAYS POWER THE BOEING 707-420s OF—

Air India International
British Overseas Airways Corporation
Lufthansa · Varig of Brazil

THE DOUGLAS DC-8/40s OF—

Alitalia · Canadian Pacific Airlines
Trans-Canada Air Lines

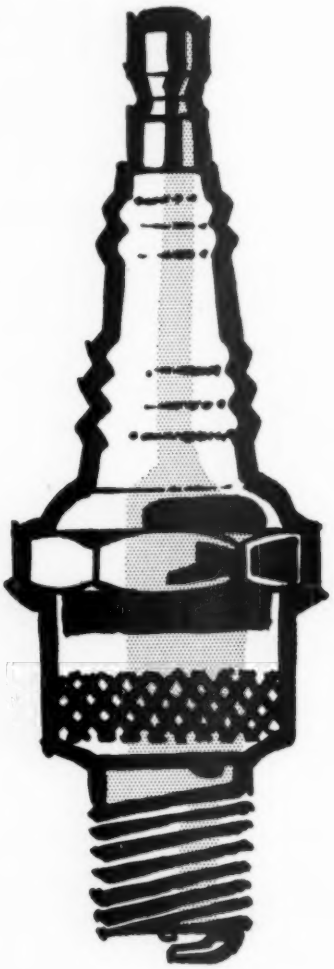
AND HAVE BEEN CHOSEN FOR THE VICKERS VC.10s OF—

British Overseas Airways Corporation

ROLLS-ROYCE LIMITED, DERBY, ENGLAND

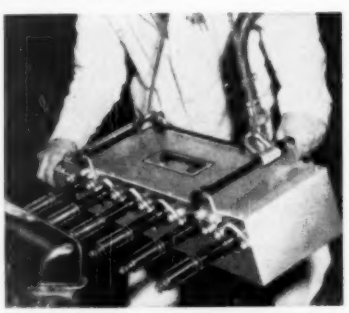
AERO ENGINES · MOTOR CARS · DIESEL AND PETROL ENGINES · ROCKET MOTORS · NUCLEAR PROPULSION

Expansion creates a number of outstanding opportunities for top grade Mechanical Designers and Development Engineers. Write to the Manager, Technical Administration, Aero Engine Division.



We have never seen a more obvious plug for Desoutter multiple plug-runners

Yet another Desoutter power tool for speeding assembly in the motor industry. This multiple tool inserts and tightens six sparking plugs, simultaneously, within 6 seconds. It uses six separate pneumatic motors which are designed to stall independently as soon as the desired torque is obtained.



Desoutter puts power into your hands

DESOUTTER BROS. LIMITED · THE HYDE · HENDON · LONDON NW9 · TELEPHONE: COLINDALE 6346
CPC329

(*Continued from page 18*)

take-off acceleration and again at re-entry when the capsule will come into the atmosphere base-first. Convair is designing the safety sensing system which will trigger the fast-acting automatic escape mechanism if the booster malfunctions on the launch pad or during powered flight.

The capsule will be launched into orbit down the Atlantic Missile Range from Cape Canaveral and will circle the Earth at an altitude of 120 miles for up to 24 hr. before descent is initiated by firing retarding rockets. After the vehicle has been slowed by aerodynamic drag, parachutes will lower it to the surface.

An extensive test programme, including experimental launchings with smaller rockets, is under way. The first "Big Joe" flight was made on Sept. 9, 1959, when a sub-orbital launch of a Mercury capsule was made by an Atlas. The test capsule was recovered.

A team of seven U.S. Air Force, Navy and Marine volunteers is receiving "the most extensive course of training ever offered to a party of prospective explorers." One of these astronauts will be picked to make the trip just before the first manned orbital launch. NASA has said the capsule flights will lead eventually to establishment of a permanent manned satellite.

Atlas also serves as booster for the Atlas-Able three-stage rocket which has been designed for deep-space launchings from Cape Canaveral. The U.S.A.F. Able shots are directed for NASA by the U.S.A.F. Ballistic Missile Division.

Atlas-Able's second-stage Aerojet engine employs liquid propellents—fuming nitric acid and UDMH. The third-stage engine is a product of Allegany Ballistics Laboratory. Spin-stabilized, with a solid-propellent motor, it is the same as Vanguard's third stage. The payload is contained in a Space Technology Laboratories vehicle with vernier control plus an injection rocket.

S.T.L. is programme manager and associate contractor to A.F.B.M.D. Convair is responsible for the booster and its adapter, and for conducting the launchings.

The first Atlas-Able launch, a lunar probe shot, took place on Nov. 26, 1959. Atlas was scheduled to hurl the two upper stages and payload into the proper flight trajectory at a point far outside the atmosphere. The booster worked satisfactorily but the flight failed because of an upper-stage malfunction.

This was the first deep-space launching from Cape Canaveral's Complex 14, one of two Atlas launch pads which have been modified to receive multi-stage vehicles such as the 98-ft. Atlas-Able. For this launching, Convair modified the Atlas by removing some telemetry gear and other normal test equipment to save weight. Standard electronic circuits were rearranged, and the autopilot and "flight programmer" were adapted to the deep-space mission. At least two additional Atlas-Able launchings are planned, the first during this summer.

Projects Midas and Samos are military satellites employing the Atlas booster and a Lockheed Agena upper stage powered by the Hustler engine developing a thrust of 15,000 lb. Both programmes are directed by the A.F.B.M.D. Lockheed is principal contractor and Convair is responsible for conducting launchings from Atlas-type complexes at Cape Canaveral and, starting in 1960, from a new complex at Point Arguello on the Pacific Missile Range, south of Vandenberg A.F.B.

Midas is a programme to develop an early warning system against enemy ballistic-missile attacks. It is based on the use of satellites carrying infra-red sensors to detect ICBMs immediately after launching. Samos (formerly Sentry) is an advanced satellite reconnaissance system.

The first Midas launching was conducted from Atlas Complex 14 at Cape Canaveral on Feb. 25, 1960. The Atlas functioned properly but a malfunction at stage separation led to the loss of the Agena vehicle. Midas II was successfully launched on May 24.

Scientific space launchings for NASA will be made by Atlas and the Agena "B" combination, starting in 1961. NASA has listed its payload capabilities as placing 5,000 lb. in a 300-mile orbit; hard-landing 800 lb. on the Moon; soft-landing 200 lb. on the Moon; or delivering 1,000 lb. to the vicinity of the inner planets.

The entire Atlas-Agena "B" combination will stand 98 ft. high and have a loaded weight of about 280,000 lb. The improved Agena "B" will be able to restart its engine in space.

Project Centaur is the first U.S. space vehicle in the "high energy" class. It will be capable initially of putting payloads of up to 4½ tons into satellite orbits or of sending large instrumented probes deep into space. It will also serve as payload stage of the huge Saturn space vehicle. Centaur employs the Atlas as booster and has a Convair-built upper stage of Atlas-type pressurized construction.

This second stage is powered by a pair of liquid hydrogen/liquid oxygen engines, developing 15,000 lb. of thrust each. First flights are scheduled in 1961 from Complex 36, the Convair-designed space launching facility under construction at Cape Canaveral.

Contracts for Centaur were originally awarded to Convair and Pratt & Whitney Aircraft by the U.S.A.F. Air Research and Development Command, as agent for the Advanced Research Projects Agency. The Centaur programme was transferred from ARPA to NASA on Jly. 1, 1959.

Centaur relies heavily on Atlas technology. Its Atlas booster has a tank of uniform 10 ft. diameter; it does not taper at the forward end as on the ballistic missile. The matching second stage is built on thin-gauge stainless steel using Atlas tooling and welding equipment. The first test tank was erected at Point Loma in September, 1959.

The next generation of space boosters beyond Centaur to be used for NASA programmes of the 1960s will have thrusts up to 1.5 million lb. They include Saturn stage 1, powered by a cluster of Atlas-type Rocketdyne engines, which is now under development for NASA and the Marshall Space Flight Center.

In 1959 Centaur was selected to serve as the payload stage of Saturn. Thus Atlas will continue to play a leading rôle in U.S. space programmes for years to come—although later as an upper-stage vehicle rather than as a basic booster.

WARNING SATELLITE.—The successful launching, on May 24, of Midas II, which is designed to give warning of enemy missile launchings and uses an infra-red detection system.

Straws in the Wind?

ALTHOUGH development of Blue Streak LRBM as a missile has been cancelled, it is interesting that some associated work has been continued. Examples are the completion of a Blue Streak launch site at Woomera and the fact that launchings of the Black Knight re-entry research vehicle have been continued. This work may augur well for a British space programme, although no official decision on this has yet been announced.

In fact, the only two launchings of the two-stage Black Knight designed specifically for re-entry tests have both been made since Blue Streak was cancelled. The first five launches were with the single-stage version.

The latest launch of the two-stage vehicle was made at Woomera on Jne. 21. The Black Knight reached a height of 300 miles and its nose-cone landed 70 miles down-range of the launch point. The second stage is fired only after the vehicle has reached the top of its trajectory, and is used to accelerate the nose-cone to a speed representative of that reached during re-entry of a missile with a range of 2,500 n.m.

Skybolt in the Commons

MR. WATKINSON, the Minister of Defence, was questioned in the House of Commons on Jne. 22 about the decision to adopt the Skybolt ALBM. He spoke about his recent trip to the U.S.; his answers clarify the Skybolt position.

"The United States Secretary of Defence and I agreed," he said "that, if the Skybolt missile is successfully developed and is compatible with the Mk. 2 V-bombers, Her Majesty's Government will place an order with the United States Government for a number of missiles and their associated equipment. Discussions will start as soon as possible to settle the financial and technical arrangements for co-operation. . . .

"As to cost, the cost of the main development of Skybolt is being borne by the United States Government. The development costs which we shall have to bear with regard to modifying V-bombers and our share of the development of the missile will be relatively small. The warheads will be British made and the cost of the actual missile cannot be firm until it is ready for production and a price negotiated."

Mr. Watkinson was subjected to a searching barrage of supplementary questions. Among points which emerged from his replies were that "there is no intention of committing the British Government to large expenditure on this missile until we see whether it is a viable and suitable weapon system or not, for the very reason . . . that the American Government are bearing the total cost of research and development." Money will be spent by Britain "on adapting the Vulcan bomber to carry the missile, to adapting the computing and calculating equipment in the bomber to guide the missile. We shall have to consider the cost of making the British warhead for the missile. . . .

"What we have now agreed in principle with the Americans is that we will go into partnership with them on this weapon because of the close links between our own Bomber Command and Strategic Air Command, which is determined to have this weapon and believes that it is only this weapon which can maintain its efficiency after about 1964-65."

As to the aircraft which will carry Skybolts, Mr. Watkinson said that "the weapon is being acquired for the equipment of Vulcans and possibly Victors. . . . No decision has been taken to use the VC10 to carry Skybolt."

He was subjected to considerable criticism by members of the Opposition; typical of their views was Mr. S. Silverman's suggestion that he had bought "a pig in a poke with a blank cheque."

Hybrid Rocketry

THE Aerojet-General Corporation has begun work on a $580,000 U.S. Navy contract to explore a new approach to rocket powerplants. This is a "hybrid" rocket designed to combine the best features of present liquid- and solid-propellent rocket powerplants. In this type of rocket motor a liquid oxidizer would be sprayed into a solid-fuel core.

The U.S. Navy Bureau of Weapons says that a successful hybrid propulsion system would offer significantly greater ranges for conventional weapons, and would provide the start-stop and variable-thrust capability needed for space missions. It would also give propulsion scientists much greater latitude in selecting the best possible fuels and oxidizers for optimum propulsion systems.

The contract calls for research, development and testing of these powerplants by Aerojet. It represents the first large-scale attempt by a U.S. government agency to combine the high performance of liquid propellents with the simplicity and compactness of solid fuels. Aerojet consider that although the contract is not a large one, it will be of the greatest importance to the future of chemical-propellent rockets.

BIG PUNCH.—Left, a Sikorsky HUS-1 helicopter of the U.S. Marine Corps was recently fitted with a Bullpup ASM. Above, the missile was launched at a target in Chesapeake Bay when the helicopter was flying at 500 ft. and 90 kt.; according to Sikorsky, "the Bullpup was the largest and first radio-controlled missile ever fired from a helicopter".

Personal Flying

THE Lockheed-Azcarate Model 60 "bush" aircraft, which received F.A.A. certification in April this year, is the first production type to make use of the new Continental turbo-supercharged engines. The Continental TS10-470 maintains its 260 b.h.p. up to 12,000 ft., and is to be installed in production L.A. 60s, which may alternatively have the normally aspirated 250-b.h.p. Continental 10-470 of the first prototype. New Continental engines being developed to use turbo-supercharging, which adds only up to 50 lb. extra weight, are the TS10-520 and TS10-550.

With the turbo-supercharged Continental, the L.A. 60 will be able to lift its 1,500-lb. useful load from high-altitude airstrips, and its STOL performance is aided by the installation of high-lift Fowler flaps. Accommodation is available for six persons in the 120-cu.-ft. cabin as an alternative to freight, of which up to 1,728 lb. may be carried at the maximum gross weight (CAR Part 8) of 3,752 lb. Normal gross is 3,532 lb., which includes 60 U.S. gal. of fuel. The tricycle undercarriage has mainwheel legs of tapered spring-steel tubes, and may be fitted with wheels, floats or skis.

The L.A. 60 was designed by the well-known team of Al and Art Mooney at Lockheed's Georgia Division, but its manufacture is to be undertaken at San Luis Potosi, Mexico, some 200 miles north of Mexico City, by Lockheed-Azcarate, S.A. First production aircraft is due in October. Aeronautica Macchi, in Italy, has been licensed for its production, and initial Italian deliveries are due towards the end of the year.

The all-metal high-wing L.A. 60 has a span of 39 ft. 4 in., a length of 28 ft. 1 in.; a height of 10 ft. 8 in.; and a wing area of 210 sq. ft. With the Continental TS10-470, it has a maximum speed of 167 m.p.h. at 15,000 ft., and an economical cruise, over 550 miles range, with reserves, of 130 m.p.h. Initial climb is 930 ft./min. at sea level, and 820 ft./min. at 10,000 ft., while the service ceiling is 23,100 ft. Stalling speed is 53 m.p.h., and take-off to 50 ft. is 1,045 ft. at sea level. This increases only to 1,350 ft. at 7,000 ft. altitude. Sea level landing distance, from 50 ft., is 1,045 ft.

TOUR DE FRANCE AERIEN.—The prototype Morane-Saulnier 880 Rallye three-seater recently concluded an extensive tour of French flying clubs and airfields, in which 62 hr. were logged and 258 persons were carried. The Rallye now has full-span slats and conventional tips.

• • •

According to a recent survey the number of private aircraft in Sweden was 438 at the beginning of 1960. In 1945 they totalled 120, a figure that soared to 364 over the next few years. In the first eight years of the 1950s the number remained largely unchanged but since then a rising trend has been noticeable.

The number of gliders has shown a steadier increase—from 81 in 1945 to 124 in 1950 and 187 in 1959.

British Women Racing Pilots of 1960

IN an initial field of 41 competitors, five women pilots entered the first event of the National Air Races—the London to Cardiff Air Race on June 3; subsequently four competed in the short-circuit races held at Rhoose Airport on the following day. Two women pilots are now eligible for entry in the King's Cup at Baginton on Jly. 9.

No newcomer to sporting flying, Margo MacKellar was flying Turbulent G-APBZ entered by Norman Jones. She completed the London-Cardiff race but unfortunately landed out during the Norton Griffiths Challenge Trophy. She started her flying in 1955 at Fair Oaks and is now a member of the Tiger Club.

Miss MacKellar competed in the 1957 National Air Races in a Tiger Moth, and again in 1959 when she was placed 14th in the Championship flying a Turbulent. Apart from flying, her main interests lie in horticulture and agriculture.

Joan Short returned just in time from her secretarial post with IATA in Canada. Flying an early Turbulent, G-APIZ, also entered by Norman Jones, she completed the course in the London-Cardiff race but missed the turning point in the Norton Griffiths Challenge Trophy event the following day.

Though she started flying in 1953 and gained her PPL with Marshalls of Cambridge during that year, she has done most of her flying in the past two years. In 1959 she entered the National Air Races for the first time and twice completed the course for the *Daily Mail* Arch to Arc air race using the appropriate combination of Turbulent and motor scooter—her best time for this event was 3 hr. 10 min.

Janet Ferguson, familiar to many pupils at Elstree where she is a full-time instructor, had to force-land her Turbulent G-APMZ during the London-Cardiff race. She started flying in 1951 and gained her PPL the following year at Denham. She passed her Assistant and Full Instructor's Ratings in 1956 and 1958 respectively. Like Joan Short she entered both the National Air Races and the *Daily Mail* air race in 1959.

The surprise of this year's National Air Races is the performance put up by two complete newcomers to sporting aviation; both Sheila Scott and Gillian Cazalet completed the London-Cardiff race, Miss Cazalet being placed 4th. In the de Havilland Tiger Moth Challenge Trophy Miss Scott earned first place in a strong and competitive field, and Miss Cazalet came in 10th. Sheila Scott now ties with G. C. Marler, who also flies a Jackaroo, for first place in her class and is joint second with a total of 56 points in the overall Championship list. Gillian Cazalet holds a total of 42 points.

Sheila Scott started flying only last June, and by September she had gained her PPL with the Wiltshire School of Flying at Thruxton. She hopes to try for her CPL in the autumn. Since acquiring her Jackaroo G-APAM she received an Award of Merit in the Jersey International Flying Rally and has recently flown down to Tangier and back through Spain. A fair success story—from *ab initio* to King's Cup entry in one year.

Gillian Cazalet who works as a mechanic with the Bristol and Wessex Aeroplane Club at Lulsgate, had her first flight in a Tiger Moth from the Surrey Flying Club in 1956 and gained her PPL with the Christchurch Aero Club in 1957, then aged 21. Her log book stands at over 180 hr. and includes experience on Gemini, Jackaroo, Taylorcraft, Autocar and Chipmunk. During this year's events she competed in Mr. T. H. Marshall's Tiger Moth G-ANPK. Although she firmly says she has only recently become interested in flying, her father, R. C. Cazalet of Eire, was a well-known and successful entrant and competitor in many pre-war sporting flying events.

KING'S CUP CONTENDER.—Miss Sheila Scott with her Jackaroo at Thruxton.

Gliding Championships: Final Report*

THE 8th World Gliding Championships are over and Rudolfo Hossinger of Argentina is to be congratulated on overtaking both Nick Goodhart, who had a later model of the Skylark 3, and the two Poles, Makula and Popiel, with their sleek and exotic Zefirs.

Hossinger, tall, lean and blond, of Swedish ancestry but born in Argentina, learned to glide in Sweden, but has worked up his present technique in Argentina during the past five years. In his own national contests two-and-a-half years ago (their summer is our winter) he finished fourth with a Slingsby Sky, but in the last World Championships he was fifth from bottom among 37 entries in the Open Class, flying a Polish Jaskolka.

This time, Hossinger's placings for each of the six separate tasks were, in order: 4, 3, 13, 17, 2, 4; his positions day by day in the total scores for the whole Championship were: 4, 3, 5, 6, 2, 1. So, like Geoffrey Stephenson in the British Nationals last year, he won the Championship without winning a single daily task—in fact, on the last contest day but two he made the slowest time but one among the 18 who reached the goal.

This day, Jne. 14, became officially the fourth contest day after the one in which Nick Goodhart rose to the top had been scrapped by majority vote of the jury on the interpretation of a rule. The task was really rather too easy for a championship meeting, for conditions were good and Oerlinghausen was directly downwind. Everyone but two in each Class got there, and even the slowest took little more than two hours.

As early as 08.25, a Standard Class machine undergoing OSTIV tests was circling up in a thermal over the camp, with cumulus clouds popping up in a way that suggested they would soon fill the sky—but luckily they did not.

This being a good soaring day, the Poles as usual did best, keeping more or less together, also as usual. Their average speeds were terrific: Witek of the Standard Class made 79.9 m.p.h., Makula 78.5 and Popiel 78.2.

Among the British pilots, the Standard Class likewise showed up best, Tony Goodhart averaging 61.5 m.p.h. to be placed 7th, and Nick Goodhart 56.3, giving him 12th place. Among the four to come down short were Tony Deane-Drummond in the Open Class and Bob Rowe of Australia in the Standard. Both were caught out in the region between the Möhne Dam and Soest, although the clouds there looked as good as anywhere else.

The opinion of those watching below was that Deane-Drummond was unknowingly on the wrong side of a cloud street, for Nick Goodhart, whom he had evidently not seen, had been doing well on the other side. After the two had landed, a locally resident Silver C pilot told them comfortingly that it was a notorious down-current region, and he had never caught any thermals there in his life.

In the total scores up to the end of this day, the two Poles were still at the top, with Haase of Germany and Marchand of France next, and Nicholas Goodhart in 5th place.

The organizers must be congratulated on at last inducing the authorities to lift the cloud-flying ban, if only for the day and in the middle section of the route from the Ruhr to the Lippe river.

Cloud flying was again allowed next day when the contest was a race round a 300-km. triangle, with turns at Hamm airfield (on the opposite side of the town from the famous railway junction) and Hirzenhain, a German gliding centre on a hill which was found notoriously difficult to locate during the practice period. On the second leg, cloud flying was allowed up to 2,100 m. (7,000 ft.) as the base of an airway had been

Top, the Zefir flown by J. Popiel which finished third. Bottom, winner of the OSTIV prize for 1960, this Standard Austria was flown by J. Fritz.

Winners take their place of honour at the closing ceremony. On the upper level are the two champions: R. Hossinger of Argentina (left) in the Open Class; and H. Huth of Germany (right) in the Standard Class. On the lower level are the runners up; left to right are: J. Popiel, E. Makula, A. Witek—all from Poland, and G. Münch from Brazil.

* Previous reports from Dr. A. E. Slater were in our issues of Jne. 10 and Jne. 17.

raised for the occasion. However, as cu-nims had developed by the time most of the competitors had got there, it may be suspected that quite a few went a good deal higher.

But cu-nims, however active, are apt to spoil a triangular race, because the gaps between them are too large to cross from the limiting height of 1,200 m. at which the turning-points have to be rounded. In the Open Class only Nicholas Goodhart completed the course of 201 miles, and then only because Heinz Huth, of the Standard Class, happened to be at the second turning point and showed him the only thermal within reach. His finish was spectacular: an extremely low approach, followed by several hundred yards of skimming just above the ground to minimize the effect of a contrary wind, and a final crossing of the line just above stalling speed, hardly a foot high, after a flight of 5 hr. 27 min.

Huth made the fastest time of 4 hr. 54 min. and one other Standard Class pilot, N. Sejstrup of Denmark, finished the course, taking 5 hr. 41 min. Several competitors missed the finish by only a few miles, such as Paul Bikle of U.S.A. in the Standard Class and the two Argentinians, Hossinger and Ortner, in the Open.

In the total scores for five days, Nick Goodhart's win placed him in the lead, indisputable this time, with 4,528 points, but Hossinger was uncomfortably close with 4,366.8, and Makula and Popiel with 4,250.7 and 4,213.1, while Jose Ortner was not far behind with 4,206.

Anything might happen next day, especially if the weather

Richard Schreder of the United States about to be launched in his Airmate HP-8 in which he made news by inadvertently landing in East Germany.

turned out difficult—and it did. At 07.15 hrs. the sky was apparently clear but a rainbow-coloured "arc of contact" could be seen above the sun, telling a tale of ice crystals at the extreme top of an approaching warm front. Within an hour of the postponed briefing at 10.30, patchy alto-stratus had appeared all over the place, and pilots who set out on the task, a 200-km. triangle via Dahlemer Binz to the S.S.W. and Hummerich to the S.E., found the thermals too poor to give any prospect of overtaking the front.

Nobody in the Open Class got round, but among four who exceeded three-quarters of the distance were the two Poles, who came down at Godesberg on the Rhine. This shows, you may say, that the exotic Zefirs can beat the rest even on a poor day. Not quite. They themselves were beaten by a 21-year-old sailplane type, the Weihe, flown by Bernard Müller of Switzerland, which went 17 miles farther and missed the finish by only 5¼ miles. And Hossinger, with his Skylark, was only 6 miles behind them.

What is more, three Standard Class machines put the Open Class to shame by completing the course: Witek of Poland in 3 hr. 58 min., Münch of Brazil in 5 hr. 59 min., and Huth of Germany in 6 hr. 25 min. The last two looked dead beat, but Huth, though the slowest, went fast enough to retain his lead over Witek and become Standard Class Champion.

Of the British pilots in the Standard Class, Tony Goodhart made a quarter of the distance, Bob Rowe of Australia a third, and Jim Harrold of Rhodesia nearly half. In the Open Class, Nick Goodhart made nearly half the distance, Tony Gaze of Australia over a third, and Tony Deane-Drummond, after being rushed back by his crew in just 1 hr. 10 min. for a second try, was launched under a surprisingly large patch of blue sky.

Why was it there instead of thickening frontal cloud? Barney Wiggin, the American team's meteorologist, said it was the trough of a large-scale wave on the warm front, where the air had cleared by descending. However, this descent evidently spoilt the thermals, for Tony Deane-Drummond managed only 25 miles.

The last possible competition day dawned unpromisingly with an extremely moist airstream which soon covered the sky with low stratus and damped the hopes of Hossinger's rivals for a last chance of overtaking him. The meteorologist, Dr. Kant, said it might "burn off" by 13.00 hrs., and it did to a large extent by 14.00 hrs. But all afternoon people could be seen circling low over the barracks and neighbouring regions without getting any effective height; so the previous day's results stood and are shown in the table.

Concluding formalities were an open-air ceremony and flying show on the airfield, a formal evening party at the Gurzenich in Cologne with a generous distribution of prizes and gifts, and an informal trip up the Rhine to Remagen and back, for which a paddle steamer was specially hired.

What of the future? The ultimate high-efficiency machine is undoubtedly worth developing for its own sake as a scientific exercise, so long as somebody can be induced to pay the cost. But in the final reckoning this time the Zefirs were sandwiched between two Skylarks. Very well; shall we say that the all-weather compromise type is best, if given a large span for efficiency? But on most days the Standard 15-m. Class put up as good a show as the Open, and sometimes better.

If Argentina should offer, as sponsor of the Champion, to hold the next Championships, and the offer is accepted, the ultimate performance types might do better there than in Germany and much better than in England. But the time for their further development would not be the usual two years: it would have to be either shortened to 1½ years or lengthened to 2½.—A. E. SLATER.

CHAMPIONSHIP RESULTS

OPEN CLASS

Place	Comp. No.	Name	Country	Total Points	Craft
1	27	R. Hossinger	Argentina	5,102.9	Skylark 3
2	14	E. Makula	Poland	5,079.1	Zefir
3	15	J. Popiel	Poland	5,020.7	Zefir
4	7	H. C. N. Goodhart	Gt. Britain	4,856.5	Olympia 419
5	16	I. S. Jonsson	Sweden	4,443.6	Zugvogel 4
6	26	J. S. Ortner	Argentina	4,399.4	Skylark 3
7	2	H. Jensen	Denmark	4,141.4	Ka-6
8	18	B. Müller	Switzerland	4,016.5	Weihe
9	3	E. G. Haase	Germany	4,001.9	Phönix
10	5	M. Marchand	France	3,774.7	Breguet 901
11	17	R. Comte	Switzerland	3,238.2	Elfe
12	6	A. J. Deane-Drummond	Gt. Britain	3,180.7	Skylark 3F
13	10	M. Bar	Israel	3,184.4	Zugvogel
14	1	F. A. O. Gaze	Australia	3,074.5	Skylark 3B
15	24	R. H. Johnson	U.S.A.	2,992.9	RHJ-6
16	25	R. E. Schreder	U.S.A.	2,891.4	Airmate HP-8
17	4	H. Tandefelt	Finland	2,881.4	Ka-6BR
18	12	J. Mrak	Yugoslavia	2,555.9	Meteor 60
19	9	G. Ferrari	Italy	1,825.8	Skylark 3B
20	8	E. van Bree	Holland	1,669.3	Skylark 3

STANDARD CLASS

Place	Comp. No.	Name	Country	Total Points	Craft
1	40	H. Huth	Germany	5,619.1	Ka-6BR
2	34	G. Münch	Brazil	5,237.8	Ka-6B
3	58	A. Witek	Poland	5,201.9	Foka
4	38	N. Sejstrup	Denmark	5,001.8	Ka-6BR
5	60	L. V. Juez	Spain	4,843.7	Ka-6
6	47	W. Toutenhoft	Holland	4,474.2	Ka-6
7	57	H. Resch	Austria	3,998.1	Standard Austria
8	49	G. Silva	Italy	3,989.3	M-100S
9	56	J. Fritz	Austria	3,907.6	Standard Austria
10	64	E. J. Harrold	S. Rhodesia	3,869.9	Ka-6
11	42	O. Rautio	Finland	3,787.2	Pik-3C
12	69	P. F. Bikle	U.S.A.	3,701.1	1-23E
13	59	M. Ara	Spain	3,699.4	Ka-6
14	46	S. Andreae	Holland	3,655.9	Ka-6
15	32	A. Xhaët	Belgium	3,407.7	Mucha Standart
16	41	J. Jalkanen	Finland	3,402.5	Pik-3C
17	35	C. Junqueira	Brazil	3,396.4	Ka-6B
18	55	T. Johannessen	Norway	3,263.0	Olympia 401
19	44	J. Lacheny	France	3,254.6	Breguet 905
20	31	R. S. Rowe	Australia	3,229.2	Ka-6BR
21	48	L. Brigliadori	Italy	3,141.3	E/C.39
22	61	P. A. Persson	Sweden	3,051.3	Zugvogel 4A
23	33	M. Doutreloup	Belgium	2,958.8	Ka-6B
24	45	G. A. J. Goodhart	Gt. Britain	2,843.6	Skylark 2
25	51	D. Arber	Israel	2,818.0	Ka-6
26	62	I. Silesmo	Sweden	2,811.8	Ka-6BR
27	71	I. Oda	Japan	2,717.9	Ka-6
28	50	F. Filipusson	Iceland	2,709.1	Ka-6
29	43	D. Barbera	France	2,588.5	Breguet 905
30	39	H. Böttcher	Germany	2,562.9	Ka-6BR
31	63	A. Gründisch	Switzerland	2,532.9	Breguet 905
32	70	J. Arteman	Argentina	2,444.0	Breguet 905
33	37	J. A. D. Friis	Denmark	1,926.6	Mucha Standart
34	52	A. Jardeny	Israel	1,909.8	Skylark 2
35	54	E. B. Mathisen	Norway	1,043.7	Zugvogel

Correspondence

Turbine Transport Orders

MY congratulations on the excellence of your "Commercial Aircraft" issue for 1960 (Apr. 29). I personally consider the general layout, etc., superior to all previous annual "Commercial Aircraft" issues.

Correct me if I'm wrong, but I detect one rather important omission from your splendidly compiled "Turbine Transport Order Book," pages 519-520. Under the heading of Douglas DC-8 orders, the name of Hawaiian Airlines should have appeared. They are *leasing* from Douglas the prototype DC-8, modified and fitted with turbofan engines; it will be delivered to Hawaiian early in 1961. They also hold options on two more turbofan DC-8s, the firm order of which depends upon the certification of at least one new transpacific route, probably Honolulu to Japan.

Nairobi. DENNIS M. POWELL.

[The DC-8 lease arrangement by Hawaiian Airlines, although reported locally, has not been confirmed by Douglas. As many reported airline re-equipment plans never come to fulfilment, particular care was taken to include in our listing only those orders which are really "firm."—ED.]

Problems of Space Law

MY distinguished friend, Sir William P. Hildred, recently gave me a copy of your issue of Jne. 3 which included an article by Mr. Kenneth Gatland entitled "Surveillance from Orbit." In that article Mr. Gatland was so kind as to refer to some of my earlier published views.

I might say, parenthetically, that he referred to me as a "Canadian authority on air law." While I had the honour to found the Institute of International Air Law at McGill University in Montreal, and while I still hold the position of Professor Emeritus at McGill, I am an American citizen and my home and research office are in Princeton, New Jersey.

Mr. Gatland is entirely correct that the basic unsettled problem affecting the law of flight-space "turns on the particular definition we give to airspace and the effective reach of the atmosphere." An international agreement is absolutely necessary if grave problems are to be avoided. The doubtful area is still between the point where the atmosphere ceases to provide aerodynamic lift for aircraft and balloons and the point where free satellite flight is practical or perhaps possible. My present personal professional views, for what they may be worth, may be restated as follows:—

(1) The airspace over a sovereign State is part of the territory of that State. Such State has the sole right to control all flight in the airspace above its lands and waters.

(2) Airspace certainly extends upward through the areas where "aircraft" may be operated which depend solely on the gaseous air for aerodynamic lift to maintain flight. However "airspace" may possibly be construed to extend further upward to include all areas where the atmosphere is sufficiently dense to contribute in any degree to aerodynamic lift, or even higher to include all areas where the atmosphere is sufficiently dense to prevent a satellite's orbit.

(3) No general rule of customary international law now exists as to the subjacent State's rights to control all flight in areas above the airspace, nor whether on the contrary such areas should be treated as free for international flight as the high seas are for shipping, although strong arguments can be made that this should be future law.

(4) Each State, however, probably now has a present right under international law and the United Nations Charter to act in outer space above it to the extent necessary for its self-protection or self-defence, even if such areas are beyond its territorial space.

(5) Flight over Stateless lands, such as Antarctica, is free at all heights and subject to no control except that of the State which launches or operates the instrumentality. Flight over the high seas is free at all heights, subject only to paragraph (4) above and the "rules of the air" adopted by the International Civil Aviation Organization under Article 12 of the Chicago Convention. The power of ICAO to adopt such rules for the control of flight over the high seas should be deemed limited to flight in the airspace and not to outer space beyond.

(6) Article 3 of the Chicago Convention prohibiting flight of State aircraft over the territory of another State, and Article 8 prohibiting the flight of pilotless aircraft, in each case without special authorization, should be construed as applicable in the airspace only, even if the annexes to the Chicago Convention are amended to widen the present definition of aircraft so that it will no longer apply only to "machines which can derive support in the atmosphere from reactions of the air."

(7) Chaos in future high-altitude flight above the airspace can be avoided only by international agreement, applicable either (a) through regulation of individual flights, or (b) through a determination of the boundary between airspace and outer space, and some understanding of international control in outer space.

JOHN COBB COOPER, LL.M., LL.D.

Princeton, New Jersey, U.S.A.

Aroundabout

TRAB, BOQ AND 111 . . . which doesn't mean I've finally gone round the bend but that this column comes to you from Toul-Rosières Air Base, Bachelor Officers Quarters, and that I'm a temporary honorary member of Treble-One Squadron, who have just delighted the local U.S.A.F. and French population, few of whom had previously seen the fabulous *Flèches Noires* show. However, Capt. Paul Hodges, RF-101 pilot, had glimpsed the act while flying past Wattisham, 111's base, about two years ago. Looking down, he saw 22 aeroplanes passing below—upside down. He says he blinked and hastily checked his flying instruments.

Flt. Lt. John Moxham, Australian member of the Hastings crew who brought 111's hard-working ground crew, with spares, was looking at a C-47 in the static display. "Reminds me of a war-time remark I heard in one of these in a South Pacific rainstorm—'This sieve leaks like an aircraft'."

Some of the RF-101 pilots in the show wore an overall badge presented by McDonnell Aircraft and inscribed "One-O-Wonder." Pilots' cynical interpretation: "Sure, we wonder how we get it off the ground."

In the Officers Club, an R.A.F. reference to something being "U/S" brought forth the slightly apologetic explanation that it meant "UnServiceable" and had no affinity (of course) with "United States." Then we learned that the U.S.A.F. equivalent was "AOC," meaning "Aircraft Out of Commission." No affinity (of course) with "Air Officer Commanding."

Sqn. Ldr. Peter Latham, O.C. 111, hopes to make smoke in colour before the end of this season, the squadron's last in the specialist aerobatic rôle, and he tells of a flight sergeant, scarlet from head to foot, entering his office and saying, "I've been experimenting with the red smoke mixture, sir."

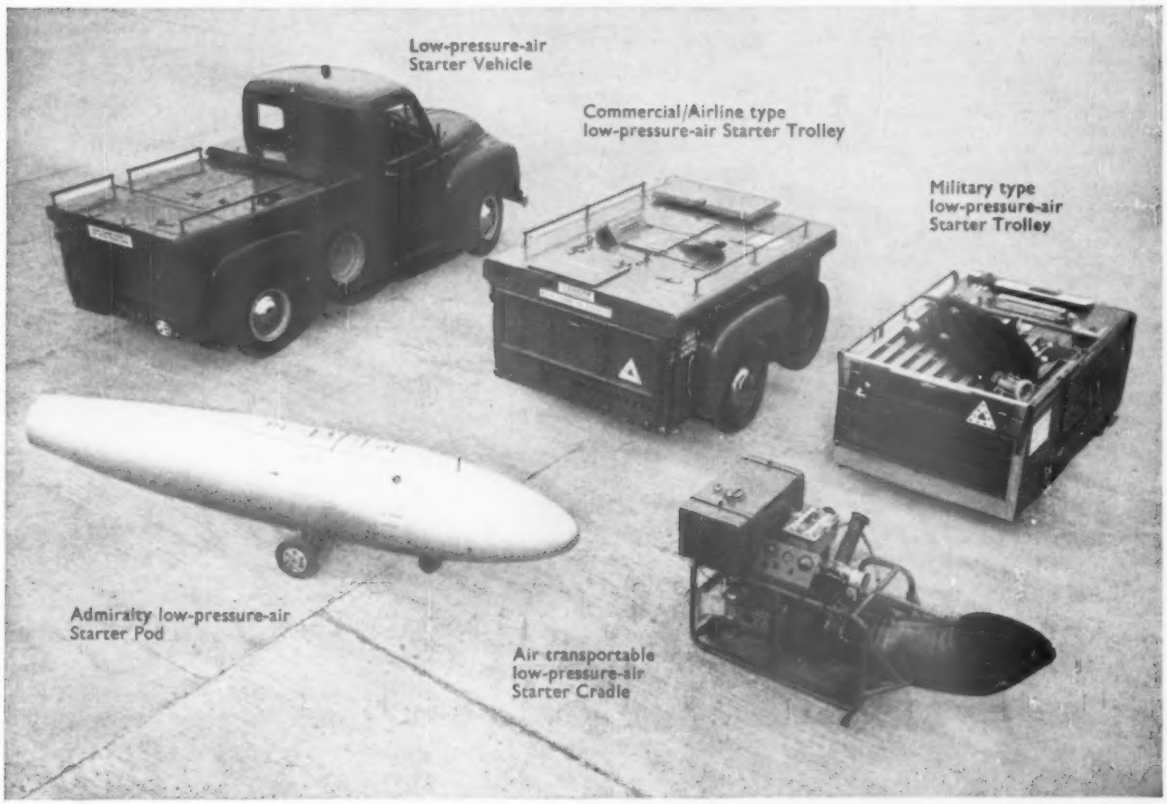
The briefing officer, Major Thomas, figured: "You Treble-One boys will probably be doing a lot of air talk during your show." Such as "Box . . . go."

The black Hunters fly back to Wattisham *en masse*, as the French say, "in one lump" as Peter says. And, if *I* may say, as cheerful, lively and capable a lump as ever did the R.A.F. and Great Britain a power of good throughout the World.

*

"I SUPPOSE THEY HAVE TO BUY THEIR OWN — STILL, ON THEIR PAY..."

To meet all gas-turbine starting requirements


Low-pressure-air Starter Vehicle
Commercial/Airline type low-pressure-air Starter Trolley
Military type low-pressure-air Starter Trolley
Admiralty low-pressure-air Starter Pod
Air transportable low-pressure-air Starter Cradle

Blackburn low-pressure-air engine starting units are in constant use by:

Aeroplane & Armament Experimental Establishment, Boscombe Down
A. V. Roe & Co. Ltd.
Bristol Siddeley Engines Ltd.
Department of [illegible] Canada
[illegible] Electric [illegible]
[illegible] Page Ltd.
D. Napier & Son Ltd.
National Research Council, Canada
Orenda Engines Ltd., Canada
Rolls-Royce [illegible]
[illegible] Establishment, Bedford
Royal Air Force
Royal Navy
The de Havilland Aircraft Co. Ltd.
The Fairey Aviation Co. Ltd.
Vickers-Armstrongs (Aircraft) Ltd.

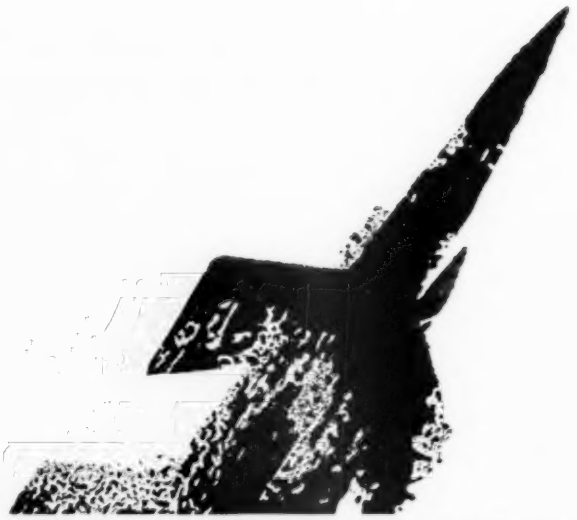
OVER 300 IN OPERATION

Blackburn
(LICENSEES FOR TURBOMECA ENGINES)

LOW-PRESSURE-AIR STARTING EQUIPMENT FOR OPERATORS OF MODERN AIRCRAFT

BLACKBURN ENGINES LIMITED, 43 BERKELEY SQUARE, LONDON W.1
Telephone: GROsvenor 5771

E165/a



developments in flight equipment...

CONTROL UNDER 'g' The new approved Hymatic Anti-G valves AG5 and AG6, developed with R.A.E., improve upon the existing standard AG2 by using air tapped from the engine compressor. Weight, bulk and servicing time are thereby saved by eliminating storage bottles, ground charging valve and separate reducing valve and filter. High or low gradient protection up to 8 g can be selected to suit personal comfort. The AG5 weighs 1.9 lb. for supply pressures up to 150 p.s.i. The AG6 weighs 2.2 lb. for supply pressures up to 300 p.s.i.

Hymatic, as leading engineers in the Aircraft equipment field, have been responsible for the design and precision manufacturing of many products, including:

Hot air reducing valves
Snap jacks and air bottles
Oil reducing valves
High pressure relief valves
Restrictor valves
Pressure maintaining valves
High flow reducing valves
Non-return valves

194

THE HYMATIC ENGINEERING COMPANY LIMITED · REDDITCH · WORCESTERSHIRE

Industry Record

New Servo-motors

The Servo Components Division of Elliott Brothers (London), Ltd., have recently published two new leaflets on some of their latest products. The first deals with DC torque-motors and the second describes AC servo-motors, and synchronous and induction motors.

Developed for the operation of servo-valves in aircraft and guided missiles, these Elliott torque-motors, based on original work undertaken at R.A.E. Units,

Moulded blanking covers are now being produced by the Plastics Division of Hunting Aircraft, Ltd., to protect the air intakes on the Jet Provost Trainer. These covers, which are moulded with Cellobond polyester resins and glass fibre, are fastened to the air intakes as part of the aircraft's ground equipment.

are available with a wide range of characteristics, and examples include motors for operation in both high temperatures and corrosive environments.

The second group of motors are Holtzer-Cabot units and are stated to be particularly suitable for applications requiring high precision, long life and good reliability. They are of the two-phase, four-pole reversible induction type wound for 115V, 50-c.p.s. supplies, although other variants can be produced.

All motors are totally enclosed and fitted with ball bearings requiring no maintenance. The servo-motors are specifically designed for high-speed process control and instrumentation applications, providing rapid starts, stops and reversals. The synchronous motors are for use where accurate timing is required, while the induction motors are suitable as continuous duty small power drives.

Silcoset Rubbers

Imperial Chemical Industries has now placed on its sales range the first three of its Silcoset silicone rubbers. These new products are solvent-free pastes which cure at room temperature to resilient silicone rubbers after the addition of a curing agent. By changing the type and concentration of the curing agent the cure times can be varied from one hour to several days.

The curing is an irreversible process and the company states that the resultant rubbers are completely stable products with all the properties of the conventional silicone rubbers. They are non-toxic, stable over the temperature range −60° C. to +250° C., and have the ability to reproduce intricate detail in moulding processes.

Suitable for moulding rubber parts where heat curing is undesirable or when the cost of moulding equipment is too great, these three new Silcoset rubbers have three different consistencies. Suggested uses include the encapsulating, potting and cushioning of electronic assemblies and the manufacture of moulds for casting resins for low-cost tooling.

Cleanliness Ensured

In recent years Lockheed Precision Products, Ltd., has specialized in the design of hydraulic equipment for commercial aircraft. Components manufactured by the company are, or will be, fitted to such aircraft as the Viscount, Comet 4, Caravelle, Dart Herald, Twin Pioneer, Vanguard, Argosy, Avro 748, de Havilland 121 and other projects. The Comet, for instance, is entirely dependent on Lockheed components for the operation of flaps, undercarriage, air brakes and powered flying controls.

Apart from the design of such equipment, the manufacturing processes involved are of a highly skilled nature and a very high degree of precision is called for. This careful machining would be to no avail, however, if assembly methods were not carefully controlled and supervised. For example, hydraulic units must be perfectly clean and fluid completely free from contaminates otherwise units could be damaged and put out of action in service.

To meet these stringent requirements, the Extended and Project Planning department of Lockheed Precision Products has recently designed and built an aircraft hydraulics assembly "clean room" at the factory at Speke. This new bay has only taken some 18 weeks to construct, at a cost of some £9,000.

With a floor space of over 3,000 sq. ft. this "clean room" will, in future, handle the assembly of all high-precision aircraft hydraulic components. A special dust-proof ventilation system with air pressure relief has been installed and up-to-date shadowless lighting is also incorporated. Under full production conditions, 30 skilled assembly technicians are employed. They are provided with Formica-faced work benches and each has lockable cupboard space under the bench in which to store special tools and personal items.

Alternator Drive Test Rig

An aircraft turbine simulator has been developed by Aircraft Ground Equipment, Ltd., of Bristol, to test constant-speed drives and alternators under similar acceleration and load conditions to those encountered during normal flight with the drive and alternator coupled to the aircraft turbine.

Operated from a remote control panel, the test unit consists of an electric motor drive coupled to a speed-increasing gearbox, fitted with output shaft and

A general view, left, of the new "clean room" which has recently come into operation at the Speke factory of Lockheed Precision Products, Ltd. Above, the company's Mk. 8 and 9 hydraulic pumps being assembled.

Industry Record . . .

mountings to receive an aircraft constant-speed drive/alternator assembly. Auxiliary supplies include alternator air blast cooling, forced oil feed to the gearbox and an oil feed to the constant-speed drive. All electrical controls are mounted on the remote panel.

To achieve the turbine simulating output conditions a DC motor drive is used, the armature of which is supplied from a grid-controlled mercury-arc rectifier. Speed control, up to a basic speed, is achieved by varying the firing angle of the mercury-arc rectifier, and thus the armature voltage. Above the basic speed, control is achieved by shunt field weakening.

The potentiometer shunt field regulator unit is driven by a servo-motor generator, which in turn is fed from a servo-amplifier. The latter controls the speed of the servo-motor generator, thus governing the acceleration of the main DC motor over a 25 : 1 range.

Governing of deceleration is accomplished by an electronically controlled disc brake, the system taking a voltage proportional to the position of the potentiometer-shunt field regulator unit as a reference, and adjusting the torque applied by the brake until it is balanced by the feedback voltage from the tacho-alternator. The deceleration is also governed over a range of 25 : 1.

Enterprise

Joseph Lucas (Industries), Ltd., through G. and E. Bradley, Ltd., and the Collins Radio Co., of America, has recently formed a new company—L.C.E., Ltd., of Electral House, Neasden Lane, N.W.10. Jointly owned by the two parent companies, L.C.E. meets the Collins requirement for a manufacturing subsidiary in Europe. It will not, however, replace the Collins office in this country which will continue to operate as a dollar sales organization for American-produced equipment.

The new company, with an initial labour force of approximately 250 which is expected to expand up to 1,000 in two or three years, is not tied to a policy of manufacturing Collins products only. It has the freedom to produce its own equipment, developed by Lucas or Bradley, or to take up licences to manufacture other products.

Expected to be in production with VOR ground beacons by September, L.C.E. will be capable of manufacturing a wide range of Collins equipment, including aeronautical airborne communications and navigational systems. Among these are the AN/ARN-62 TACAN system; the 618F-1 lightweight communications transceiver which provides 360 VHF channels; the 17L-8A/51X-3 VHF communications system comprising a 90-channel transmitter and a 190-channel receiver, and the 618-T HF/SSB airborne transceiver providing 28,000 selectable channels in the 2-30 Mc/s range.

PUBLICATIONS RECEIVED

Flight Without Formulæ. Third, fully revised edition of a well-known basic introduction to aerodynamics, of which THE AEROPLANE said 20 years ago ". . . it takes the sigh out of science, and reads as easily as a thriller." By A. C. Kermode, C.B.E., M.A., F.R.Ae.S. 371 pp.; 5 in. by 7½ in. Illustrated. Sir Isaac Pitman and Sons, Ltd. Price 21s.

The Smirnoff Story. Biography, based on his own account to the author, of the colourful pilot who flew more than 27,000 hr. with the R.F.C., S.E.N.T.A. and K.L.M. By Anne Robertson Couper. 286 pp.; 5½ in. by 8½ in. Illustrated. Hutchinson and Co. Price 25s. (All royalties to the Imperial Cancer Research Fund.)

The flight shed of Aviation Traders at Southend Airport illuminated by Benjamin 8-ft. Taskmaster fluorescent fittings. Coupled together to form continuous runs, the fittings contain 125-W. tubes.

Aviation Calendar

Jly. 2

Abbotsinch.—R.N. Air Station "Air Day," organized by the Fleet Air Arm.

St. Gatien, Deauville.—Invitation Air Rally for Members and Associate Members of the Royal Aero Club; until Jly. 4.

Jly. 4

Harrogate.—British Computer Society Conference, in the Sun Pavilion.

Jly. 8

Baginton, Coventry.—Lockheed International Aerobatic Competition and King's Cup Air Race, organized by the Royal Aero Club; and Jly. 9.

Jly. 9

Exeter.—Air Show.

Jly. 10

Elstree.—Pilots' Rally, organized by the Elstree Flying Club, at Elstree Aerodrome.

Jly. 15

Culdrose.—R.N. Air Station "Air Day," organized by the Fleet Air Arm.

Jly. 16

Odiham.—Inter Command R.A.F. Gliding and Soaring Association Gliding Week; until Jly. 23.

Brawdy.—R.N. Air Station "Air Day," organized by the Fleet Air Arm.

Jly. 17

Woburn Abbey.—Rally organized by the Royal Aero Club.

Jly. 21

London.—Third International Conference on Medical Electronics and Associated Scientific Exhibition, organized by the Electronics and Communication Section of the Institution of Electrical Engineers, at Olympia; until Jly. 27.

Jly. 23

Odiham.—Inter-Service Gliding week; until Aug. 1.

Lossiemouth.—R.N. Air Station "Air Day," organized by the Fleet Air Arm.

Jly. 24

Sutton Bank.—Gliding week, organized by the Yorkshire Gliding Club.

Dunstable.—Gliding week, organized by the London Gliding Club.

Camphill.—Gliding week, organized by the Derby and Lancashire Gliding Club.

Company Notices

NEW COMPANIES

S.S. Aviation, Ltd. (659,568).—Private co. Reg. May 17. Cap. £100 in £1 shs. Operators of aircraft and air services, etc. Director: Basil G. Salmon. Sec.: Thelma A. Salmon. Sols.: Stephen Rayner and Co., E.C.1. Reg. off.: Lisboa Cottage, Shottenden, Chilham, nr. Canterbury, Kent.

Air Facilities, Ltd. (660,939).—Private co. Reg. May 30. Cap. £100 in £1 shs. Maintenance contractors, cleaners, repairers and decorators of the interiors and exteriors of aircraft; contractors for heating, ventilating and air-conditioning of aircraft. Sols.: Norton, Rose and Co., Kempson House, Camomile Street, E.C.3. Reg. off.: 30 Southampton Buildings, Chancery Lane, W.C.2.

New Patents

APPLICATIONS ACCEPTED

843,770.—**Hughes Aircraft Co.**—"Radar fire control system."—Jne. 12, 1956.

843,923.—**De Havilland Engine Co., Ltd.**—"Apparatus in which heat exchange takes place between fluids."—Dec. 20, 1957. (Jan. 17, 1957.)

841,181.—**Curtiss-Wright Corporation.**—"Helicopter prime move speed control."—Oct. 21, 1957. (Divided out of 844,180.)

844,508.—**Goodyear Aircraft Corporation.**—"Control system for a jet engine thrust reverser."—May 7, 1958. (Jly. 26, 1957.)

844,537.—**United Aircraft Corporation.**—"Aerodynamic control mechanism for delta-wing aircraft."—May 28, 1957. (May 31, 1956.)

844,519.—**Zborowski, Von, H.P.G.A.R.**—"Aircraft." Jne. 17, 1958. (Jne. 18, 1957).

844,313.—**Irving Air Chute of Great Britain, Ltd.**—"Parachute packs."—Dec. 10, 1958. (Dec. 17, 1957.)

Printed specifications of the above will be available on Aug. 10, 1960 and the opposition period will expire on Nov. 10, 1960.

CHANGE OF NAME

Sunpen, Ltd. (638,983), 17 St. Helen's Place, London, E.C.3.—Name changed to Aircraft Engineering Components, Ltd., on Jan. 15, 1960.

INCREASES OF CAPITAL

Hunting Surveys, Ltd. (328,992).—(Formerly Hunting Aerosurveys, Ltd.) 4 Albemarle Street, W.1. Increased by £250,000 in £1 ordinary shares, beyond the registered capital of £250,000.

Personal Notices

BIRTHS

Daniels.—On Jne. 15, at Nordsee Klinik, Sylt, to Marion (*née* Keys), wife of Flt. Lt. J. G. Daniels—a son.

Morgan.—On Jne. 16, at B.M.H., Rinteln, Germany, to Mary (*née* Muir), wife of Flt. Lt. L. R. Morgan—a son.

Witherow.—On Jne. 11, at R.A.F. Hospital, Nocton Hall, to Johanna (*née* Ludwig), wife of Flt. Lt. J. H. Witherow—a daughter.

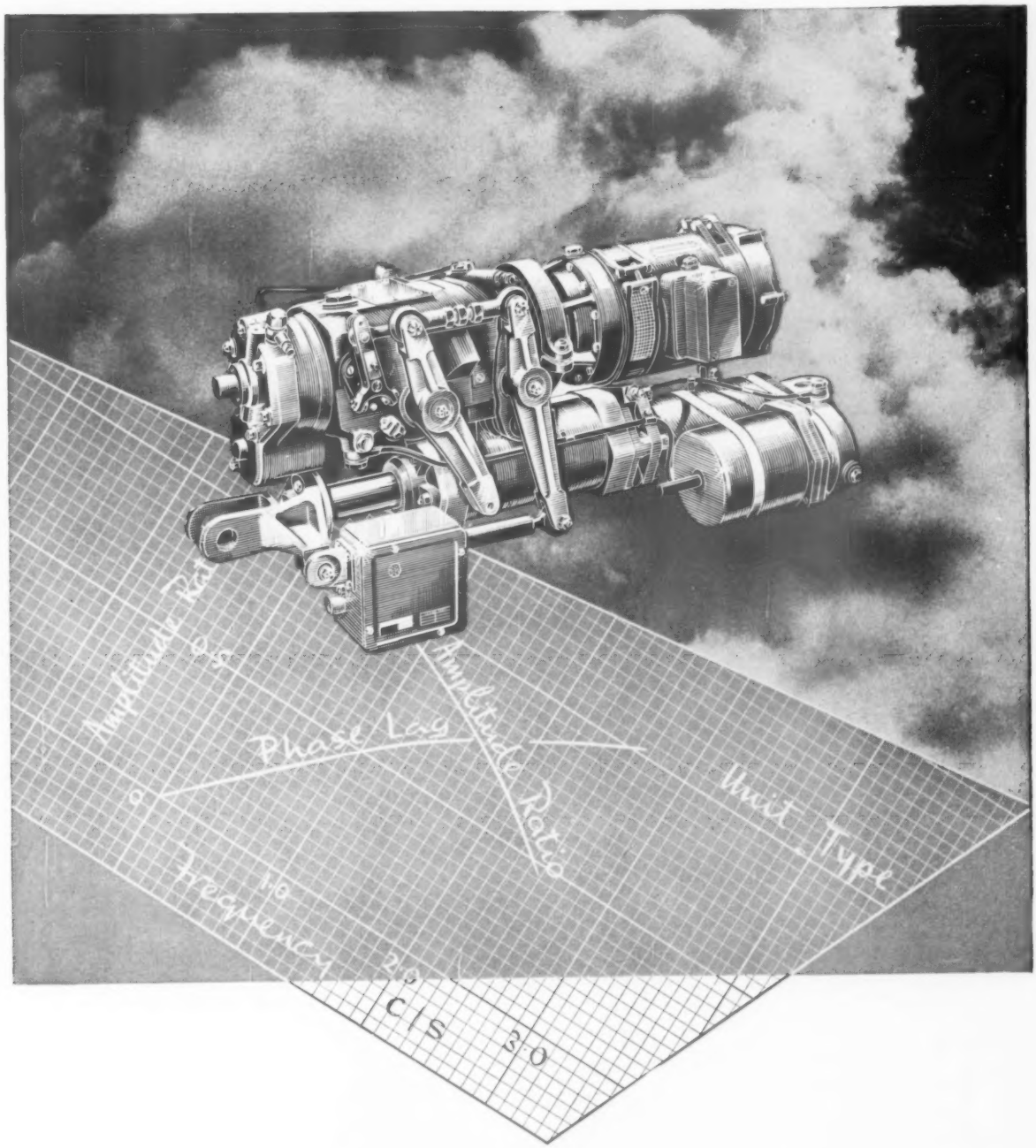
MARRIAGE

Rumsey—Durand.—On Jne. 14, Wg. Cdr. H. R. E. Rumsey to Patricia M. Durand.

DEATHS

Gilbert.—On Jne. 16, Dr. Miriam Gilbert.

Mills.—On Jne. 15, Air Cdre. Reginald Leslie Mills, C.B.E., R.A.F. (Retd.).



POWER CONTROLS

Split surface control provides duplication for the Boulton Paul powered flying control unit shown in the illustration. This unit, which incorporates an integral autostabilizer servo motor, operates the inboard elevons of the Avro Vulcan B. Mk. 2 aircraft

BOULTON PAUL AIRCRAFT LTD.

WOLVERHAMPTON, ENGLAND

P.C.26

THE AEROPLANE

PICTORIAL REVIEW (No. 4)

Containing over 230 of the Finest Photographs from "The Aeroplane and Astronautics."

A fascinating pictorial record of the Aeronautical Year, the 4th edition of this popular annual contains some of the finest air-to-air photographs of the World's latest types of aircraft, both in service and under development.

The newest fighters, bombers, transports and trainers of the World's air forces, the latest jet and turbo-prop aircraft of the World's airlines, the helicopters and the hovercraft, all are featured in striking photographs accompanied by informative captions.

Included, too, are the Guided Missiles, VTOL aircraft and the research projects of a new age of aviation, as well as a special section devoted to the Farnborough Display and to the star performers at this greatest of all flying shows.

An ideal gift, "The Aeroplane Pictorial Review" is a book that will be studied, enjoyed and long kept for reference by the air-minded of all ages.

7½ in. x 10 in. 128 pages. Over 230 illustrations. Fabroleen Board Covers.

Price 12s. 6d. net. By post 13s. 7d. From Booksellers or by post from the Publishers.

TEMPLE PRESS BOOKS, Bowling Green Lane, London, E.C.1

AVIATION TRADERS LTD

CIVIL PRENTICE

- ★ Up to 7 seats
- ★ Cruises at 125 m.p.h.
- ★ Full dual control
- ★ Full instrumentation
- ★ Automatic stall warning
- ★ Cabin heat
- ★ All-metal construction
- ★ Range 450 or 900 miles
- ★ Consumption 11.5 g.p.h.
- ★ Glider and banner towing—all models
- ★ 3 year C. of A.
- ★ 6 months warranty
- ★ Full spares backing
- ★ Pool exchange
- ★ Fixed price servicing

Price £2,000

Standard 4-seat Model.
Customer's choice trim and paint scheme.
Delivery: Standard, immediate. Customer built, 4 weeks.

AVIATION TRADERS LTD
Southend Airport, Southend, Essex
Rochford 54491

Airline Air Spares Ltd.
Associated with
T. D. Keegan Ltd.

DC.4 SPARES FULLY RELEASED

R.2000/D3 engines @ $3.50 per hour to run plus your time expired engine.
Propellers 23E50/6507AO $ 900. each
C.S.U. 4G8/P63M .. $ 77.40 „
Carburettors PD12F13 .. $ 464.40 „
Power plants .. .. $5000. „
Auto mixture control 395783 .. .. .. $ 46.23 „
Sparking plugs (set) .. $ 51.06

Additionally we stock over $200,000 worth of BRAND NEW C.A.A. and A.R.B. released engine overhaul spares. Genuine P. & W. only.

★ EX STOCK
★ IMMEDIATE DELIVERY
★ CREDIT TERMS
PAYMENT IN ALL CURRENCIES

Write, phone or call today.

AIRLINE AIR SPARES LTD.
SOUTHEND AIRPORT
SOUTHEND-ON-SEA, ESSEX
Telephone: ROCHFORD 56881-2-3 Telex 1943
For A.O.G. services after office hours 'Phone Mr. Edwards, Southend 47828, or Mr. Noble, Southend 43863. 2

Commission paid to any brokers introducing clients

for

VISCOUNTS

and

VIKINGS

BARE HULL CHARTER

from

MAITLAND DREWERY

128 STATION ROAD
SIDCUP · KENT

Telephone: FOOtscray 6761

THE AEROPLANE and ASTRONAUTICS

CLASSIFIED ADVERTISEMENTS

PRESS DAY: First Post, THURSDAY

RATE: 1/- per word (minimum 12 words 12/-).

AIRCRAFT FOR SALE

R. K. DUNDAS, LTD.,

OFFER THE FOLLOWING EXCEPTIONAL AIRCRAFT.

1955 Super Custom Tripacer "150," red and white, in excellent condition, total time 1,300 hours with only 60 hours s.m.o. on engine, Narco VHT-3 Superhomer and LFR-1, all instruments overhauled, £2,995.

1958 Super Custom Tripacer "150," red and white, in excellent condition throughout, total time 1,300 hours with only 160 s.m.o. on engine, Narco VHT-3 Superhomer and LFR-1, all instruments overhauled, £3,595.

1958 Super Custom Tripacer "160," blue and white, in immaculate condition throughout, Narco Superhomer VHT-3 and LFR-3, total time 1,140 hours with nil hours s.m.o. on engine, all instruments overhauled, £3,745.

1959 PA-18 Deluxe "150," Narco VHT-3 Superhomer, engine shielding, total time since new engine and airframe, 110 hours, finished in beautiful red and white, £3,035.

1959 PA-18 De luxe "95," Narco VHT-3 Superhomer, engine shielding, in immaculate condition throughout, only 298 hours total time engine and airframe since new, £2,660.

IN addition to having supplied to date the finest used American aircraft in Europe, including U.K., we have done so in the largest quantities. No other dealer has supplied as many and at as low a price as us. This is a direct result of our efficient New York organization where we have our own British Managed Branch—no middleman, no additional commissions to pay. Thus, the lowest price for the finest airplane.

WE are also willing to demonstrate most types as a free service. Our own Staff pilots will provide a free conversion on type to every customer where requested.

PLUS a free advisory service, and after-sales service. Only Dundas can provide the finest aircraft at the lowest price.

R. K. DUNDAS, LTD., Dundas House, 59 Saint James's St., London, S.W.1. Phone, Hyde Park 1717. Cables, "Dundas, Piccy, London." 541-17

ROLLASONS pay full P.P.L. course at club of your choice when you contract to buy a Jodel. For details of this and of the Turbulent and rebuilt Tiger Moths, phone Croydon 5151, or write Rollason Aircraft and Engines, Ltd., Croydon Airport. zzz-737

TIPSEY Trainer, with Bianchi Full-Vue canopy, special trimmer and seats, genuine 100 m.p.h. cruise; 150 yd. take-off and land; 3½ gal. per hr.; permit to fly March, 1961, approx. 500 total hours airframe, 100 engine (not raced); carefully maintained. A comfortable 2-seater, delightful to fly. £975 or best. J. O. Hodgson, "Velden," Carre St., Sleaford, Lincs. Phone 96. 541-9014

PBY 5A.

TWO AMPHIBIANS CONVERTED FOR TWO-CREW CARGO-PASSENGER USE.

BOX A404,

Care of THE AEROPLANE AND ASTRONAUTICS. 541-16

TIGER MOTH Glider tug, fully-equipped dual, currently towing; C. of A., April 1961. Offers over £500 to Hon. Sec., Surrey Gliding Club, Homestead, Farnham Rd., Odiham, Hants. 541-4

FOR SALE.

C-46F AIRCRAFT.

PASSENGER AND CARGO

WITH OR WITHOUT

T-CATEGORY KIT INSTALLED.

IMMEDIATE DELIVERY.

THE FLYING TIGER LINE, INC.,

BURBANK, CALIF.

CALL OR CABLE.

FRED BENINGER,

EXECUTIVE VICE-PRESIDENT.

Phone, Stanley 7-3411. Cable, "Flytiger." 541-733

TIGER MOTH for sale, £750 or near offer, completely rebuilt, aluminium head engine, 250 hours, best Tiger in U.K. Lancashire Aero Club, Barton Aerodrome, Eccles. 542-9021

W. S. SHACKLETON LTD

Europe's Leading Aircraft Brokers offer

de HAVILLAND HERONS

Among the excellent de Havilland Heron aircraft we are now able to offer for immediate sale is the fleet of seven Series 2 Herons owned by the Indian Airlines Corporation.

Our company has been appointed the exclusive agents for the sale of these aircraft.

As it is the intention of our principals to place these aircraft on the market at a realistic price, we have been instructed to submit any firm offers for one or more of these aeroplanes. This is an unprecedented opportunity of acquiring first rate feeder line transport aircraft at an attractive price.

W. S. SHACKLETON LTD.,
175, Piccadilly, London, W.1

Phone: HYDe Park 2448-9 Cable: Shackhud, London

PIAGGIO of GENOA

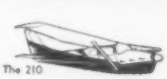
5 popular P.166 Executives have been bought by British business flyers during the first year that it has been in production

British Representatives

AERO-ENTERPRISES
(Boreham Wood) Ltd.
17 Drayton Rd., Boreham Wood Herts. ELS 2688

VIGORS FOR PIPERS

KIDLINGTON 3059—OXFORD



Cessna

SOLE DISTRIBUTORS IN GREAT BRITAIN ARE

AIRWORK SERVICES

35 PICCADILLY W.I. REG 8494

AIGLET, Gypsy Major 1 with radio, extra wing tank, etc., based Barton, Manchester. For full details write Anderton, 18 Lever Edge Lane, Bolton. Phone. 5090. 541-6

AUSTER J1.B. Aiglet, Gypsy Major 1. 338 hrs. since new, 127 s.m.o.h., total airframe 1,120 hrs., fitted radio, long-range belly, exceptionally clean, robust, economical aircraft, as is, without C. of A. Immediate reasonable offer secures. Contact, Tussaud, Royal Aero Club, Piccadilly. 541-x6780

GEMINI M65, Cirrus IIs, port 505 hr. 30 min. starboard 218 hr. 10 min., airframe 1,093 hr., nil hr. since C. of A., equipped with full dual control, throttles, rudders and sticks, Plessy 6-channel PTR61 radio, long-range tanks, new batteries, C. of A. renewed until June, 1963, repainted silver-maroon-white, fully modified to date including anti-spin tail wheel and eyebrows, accept £1,950; terms available, would consider hiring. Pedigree Cars, 340-2 Euston Rd., N.W.1. Eus 7889. 541-11

FOUR D.H. Dove Mk. 1B, full airline standard, excellent condition, available immediately from £9,000. Channel Airways, Southend Airport, Essex. Phone, Rochford 56460. 541-13

AUSTER J.1.N. fitted with Gipsy Major 1F, two wing tanks and belly tanks, giving total capacity 45 gallons, four seats, total airframe hours since new, 1957, 800 hours, engine hours since complete overhaul 980, C. of A. valid till December, 1960, available immediate delivery.

GIPSY Major 10 Mark II time expired or nil-hour engine available immediate delivery, lowest prices. MITCHELLS AIRCRAFT, LTD., Airport, Portsmouth. Phone 63530. 541-19

EXECUTIVE

DE HAVILLAND DOVE

TOTAL TIME 1,146 HR

BOX A403,

Care of THE AEROPLANE AND ASTRONAUTICS. 541-15

PETER CLIFFORD AND CO.

MILES Hawk Major, airframe hours 2,263, engine hours 718, C. of A. expires 25.2.61, £550.

MILES Messenger IIA, airframe hours 828, engine hours 327, C. of A. expires 8.4.61, £1,550.

INQUIRIES invited for any type of aircraft or radio.

TRESA, Kirtlington, near Oxford. Phone, Kidlington 3355, Bletchington 392. 541-18

Aircraft Wanted

SCRAP aircraft aluminium and stainless steel urgently required. Lowton Metals, Ltd., Lowton St. Mary's, near Warrington. Leigh 1444-5. zzz-711

AUTOCRAT wanted, radio essential. Lancashire Aero Club, Barton Aerodrome, Eccles. 542-9020

AIRCRAFT ACCESSORIES, SPARES AND COMPONENTS

THE REGIONAL AIR TRADING CO., Croydon Airport, for Rapide spares of every description. Phone, Croydon 8521. zzz-714

ROLLASONS for Tiger Moth spares and for Gipsy engine overhauls and spares. Croydon 5151. zzz-738

FOR SALE.

SPARE PARTS INVENTORY

FOR

C-46, DC-4, DC-6 AIRCRAFT,

ALSO

PRATT & WHITNEY R2800

CB16/17 ENGINES.

THE FLYING TIGER LINE, INC.,

BURBANK, CALIF.

CALL OR CABLE.

DOUG DULY.

Phone, Triangle 7-3411. Cable, Flytiger. 541-725

PHILLIPS AND WHITE, LTD.

THE leading stockists in the U.K. for: Instruments, navigational equipment, electrical components and parts, and engine accessories. Spares for de Havilland Gipsy Major and Queen series and Armstrong Siddeley Cheetah IX, X and XV engines.

61 QUEEN'S GARDENS, London, W.2. Phone, Ambassador 8651, 2764. Cables, "Gyrair London." zzz-748

AIRWORK SERVICES LIMITED

RADIO DIVISION

Specialists in Sales, Spares, Overhauls, Maintenance, Installations, Modifications.

Enquiries to: **Airwork Services Ltd.,** Bournemouth (Hurn) Airport, Hampshire. Tel: Christchurch 2732

Air Traffic Control Officers

for

MINISTRY OF AVIATION

Age 23 to 35. Good education and recent aircrew or air traffic control experience essential. Salaries: while training £775 to £1,130 according to age; when fully trained approximately £950 at age 25; £1,160 at age 30 or over rising to £1,480.

Promotion prospects.

Write Civil Service Commission, Burlington Gardens, London, W.1

for application form, quoting 5084/60.

BRITISH WIRE THREAD INSERTS

Precision made in Carbon Steel for Aluminium and Magnesium. Also in Stainless Steel and Bronze.

B.S.F.
Metric
B.S.P.
B.A.
Whitworth
Unified.

CROSS

MANUFACTURING CO. (1938) LTD.

COMBE DOWN, BATH, SOMERSET

Phone: COMBE DOWN 2355/8 *Grams:* 'CIRCLE' BATH

REPAIRCRAFT, LTD., The Common, Cranleigh, Surrey (Cranleigh 536), for instrument and auto-pilot overhaul. zzz-749

AIRFRAME spares for Dakotas, Harvards, Piper Cub, Fairchilds, Argus, Beechcraft, D-17s, Mosquito, Spitfire, Firefly. Engine spares for Pratt & Whitney, Armstrong Siddeley, Lycoming, etc., accessories and instruments for all types of aircraft.

C.47 Dakota operators please note, we offer a limited number of genuine brand-new Bendix 52058 tail wheels at a reasonable price. A. J. WALTER, LTD., The Drive, Horley, Surrey. Phone: Horley 1420 and 4294. Cables, "Cubeng, Horley." 541-12

HELICOPTERS

HELICOPTERS SERVICES, LTD., offer their aircraft for all charter services. 96 Piccadilly, London, W.1. Gro 5495-6. zzz-744

BUILDINGS

STEEL-FRAMED buildings for sale, 8 ft. to 400 ft. clear width, as workshops, storage hangar buildings, etc. Please write details of requirements. Bellman Hangars, Ltd., Hobart House, Grosvenor Place, London, S.W.1. 541-736

CLOTHING

R.A.F. Officers' uniforms for sale, new and reconditioned. Fisher's, 86-88 Wellington St., Woolwich. Phone 1055. Kit also purchased. zzz-721

CONSULTANTS

R. H. STOCKEN, F.R.Ae.S., Eagle House, 109 Jermyn St., S.W.1. Whitehall 2777-9. zzz-743

IAN L. S. McNICOL, London School Air Navigation. Pilot and navigator training with advisory service. 33 Ovington Square, Knightsbridge, S.W.3. Ken 8821. zzz-746

R. W. SUTTON (CONSULTANTS), LTD., 7 Lansdown Place, Cheltenham. Phone 5811. 547-8985

ENGINES AND ENGINE SPARES

ENGINE overhauls. Hants and Sussex Aviation, Ltd., offer Britain's most comprehensive overhaul service, including magneto and component overhaul, with spares supply. All D.H. range up to Queen 30 Mk. 2 for Heron, Armstrong Siddeley, Blackburn Cirrus, Lycoming, and United Kingdom distributors of Continental motors. Huge exchange pool most type engines. Specialists in export work. Address, The Airport, Portsmouth, Hants. Phone 63051. 541-693

HIRE AND CHARTER

RAPIDES for hire and charter. A. J. Whittemore (Aceradio), Ltd., Biggin Hill Aerodrome, Kent. zzz-0731

VICKERS Viscounts for charter. W. S. Shackleton, Ltd., 175 Piccadilly, London, W.1. 541-14

NOTICES

AIR TRANSPORT ADVISORY COUNCIL

THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services:—

FROM DAN-AIR SERVICES, LTD., OF 36-38 NEW BROAD STREET, LONDON, E.C.2:—

APPLICATION NO. 3588 for a U.K. Internal Service with Dove, Dakota, Bristol 170 and Ambassador aircraft for the carriage of passengers, supplementary freight and mail on the route Bristol-Staverton-Isle of Man at a frequency of seven return flights weekly for seven years from August 1, 1960.

FROM STARWAYS, LTD., OF LIVERPOOL AIRPORT, LIVERPOOL, 24:—

APPLICATION NO. 3596 for a seasonal Normal Scheduled Service with Dakota aircraft for the carriage of passengers, supplementary freight and mail between Liverpool and Dinard at an initial frequency of seven return flights weekly increasing later in accordance with traffic demand from May to October each year for seven years from 1961.

FROM AIRLINES (JERSEY), LTD., OF STATES AIRPORT, JERSEY, C.I.:—

APPLICATION NO. 3597 for a U.K. Internal Service with Heron and Dakota aircraft, for the carriage of passengers, supplementary freight and mail on the route Exeter and/or Cardiff and/or Bristol and/or Bournemouth, at a frequency in accordance with traffic demand for seven years from date of approval.

FROM MORTON AIR SERVICES, LTD., OF GATWICK AIRPORT, HORLEY, SURREY:—

APPLICATION NO. 740/2 for permission to operate with Viscount aircraft in addition to the Dove, Heron and Dakota aircraft which they are already authorized to operate on the Normal Scheduled Service between London (Gatwick) and Rotterdam, at a frequency of three return flights daily until July 7, 1962.

These applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on July 30, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3 Dean's Yard, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. 541-9

PACKING AND SHIPPING

R. AND J. PARK, LTD., 143-9 Fenchurch St., E.C.3. Phone, Mansion House 3089. Official packers and shippers to the aircraft industry. zzz-674

PHOTOGRAPHY

AEROPLANE photography, 5,000 available, including 1914-18 warplanes, latest U.S.A. and British jets, 5½ by 3½ in., 8s. per dozen. Lists and specimens, 2s. 6d. post free. Also thousands of ships and railways. Real Photographs, Ltd., Victoria House, Southport. 541-10

MIDDLE EAST AIRLINES (BEIRUT)

(BOAC ASSOCIATE)

on introducing the COMET have vacancies for:—

5 FIRST OFFICERS

Minimum Qualifications:—Valid C.P.L./Inst. Rating. 3,500 hours total flying of which 750 hours should be in command. Turbine experience of 1,000 hours also required.

13 ENGINEER OFFICERS

Minimum Qualifications:—Valid Flt. Eng. Licence. 1,000 hours on 4-engine aircraft. Max. age 45 years.

APPLICATION FORMS from P.M. BOAC A.C. Stratton House, Stratton Street, London, W.1.

THE BRITISH AIRLINE PILOTS ASSOCIATION

81, New Road, Harlington, Middx. *Tel.* HAYes 3442/3

Membership open to all Commercial and Service Pilots. For full details as to Objects and particulars of Membership, please write to General Secretary.

PRATT & WHITNEY R.985-B5 ENGINE

TIME EXPIRED
COMPLETE ACCESSORIES

£700

or Overhauled/Certified £1,450

STARAVIA LTD

Redfields Works, Church Crookham Nr. Aldershot Hants

AIR PARTS LIMITED

403 Caledonian Rd., London, N.7

Tel.: North 5018-9

Cables: Aircaly, London, N.7

For fully approved A.G.S. & A.N. hardware, quick service, enormous range. *Monthly Catalogue.*

Overseas enquiries welcome.

STEEL SHELVING

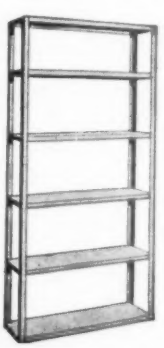
6' high, 34" wide, 12" deep.
6 shelves as illustrated.

£3.15.0

IMMEDIATE FREE DELIVERY

- ★ Each Shelf will hold over 3 cwt.
- ★ Shelves adjustable every 2 ins.
- ★ Stove enamelled dark Green.
- ★ Other sizes made to order.

SEND FOR LIST.



ROCHDALE METAL PRODUCTS

Devon St. Works

Tel. Rochdale 40070/40078

RADIO AND RADAR

SPERRY ZERO reader, Type ZLI course selectors, control panels, flight computers and indicators, three complete installations in stock. A. J. Whittemore (Aeradio), Ltd., Biggin Hill Aerodrome, Kent. zzz-0729

STR12D, STR9Z, STR9X and most other British and American VHF R/T equipment always in stock. A.R.B.-approved design installations into any type of aircraft. A. J. Whittemore (Aeradio), Ltd., Biggin Hill Aerodrome, Kent. zzz-0730

RADAR height-finding cabins, type 13/6, practically complete. Offers required. Box A011, care of THE AEROPLANE AND ASTRONAUTICS. zzz-718

SITUATIONS VACANT

A.F.R.Ae.S., A.R.B.Certs., A.M.I.Mech.E., etc., on "no pass, no fee" terms. Over 95% successes. For details of exams and courses in all branches of aeronautical work, aero engines, mechanical engineering, etc., write for 148-page handbook—free. B.I.E.T. (Dept. 703), 29 Wrights Lane, London, W.8. zzz-740

EAGLE AIRWAYS (Bermuda), have the following immediate vacancies:—

A AND C Licensed Engineer Viscount Aircraft. Based Bermuda, £180-£187 per month.

A AND C Licensed Engineer Viscount Aircraft. Based Miami, $725 per month.

APPLY: Chief Engineer, Eagle Aircraft Services, Ltd., London Airport, Hounslow, Middx. 541-9007

APPLICATIONS are invited from Aircraft Engineers holding licences in categories A and/or C for the de Havilland Dove and Heron. Vacancies are in the U.K. and overseas. Apply Contracts Division, British United Airways, National Works, Bath Rd., Hounslow, Middx. 541-9015

HAWKER SIDDELEY AVIATION, LTD.
FOLLAND AIRCRAFT, LTD.,
OF HAMBLE.

Invite applications for the following

DESIGN OFFICE APPOINTMENTS:

SENIOR ENGINEER.

A group leader is required to take responsibility for aeroelastic work. The work entails detail analysis on high-speed fighter aircraft and large transport aircraft, together with a wide range of project studies. This is a senior staff position and a degree or equivalent qualification with at least five years' experience would be essential. The applicant should be prepared to actively participate in ground and flight test programmes, and should preferably have knowledge of computor techniques as applied to this subject.

SENIOR AERODYNAMICIST.

A senior man is required for flight test planning and analysis in connection with the flight development programme for the Gnat. This appointment is with our aerodynamics department, and entails active participation in day-to-day operation of the flight test programme. Applicants should have had direct experience of performance and handling flight test procedure and analysis, and also possess a degree or equivalent qualification, with a minimum of three years' experience.

SENIOR STRESSMAN

A senior man required for comprehensive and interesting programme of work. B.Sc. or equivalent qualification with some years' experience in the stress analysis field. Knowledge of the application of digital computers to the stress analysis sphere would be an advantage.

These appointments are permanent, progressive, and offer senior staff status at salaries commensurate to responsibility qualification and experience. Hawker Siddeley Group Superannuation, with excellent conditions of employment social and welfare facilities in a pleasant South Coast area.

Applications to the
PERSONNEL MANAGER,
FOLLAND AIRCRAFT, LTD.,
HAMBLE (NEAR SOUTHAMPTON).
Phone, Hamble 3371. 541-3

PROJECT Engineers and a number of assistants are required by the research and development department, aerodynamics and design section, to undertake interesting and varied design development work on parachute systems for a range of requirements.

THE work will also involve attendance at, and analysis of, flight trials. The ideal candidate for the senior posts would have a degree in aeronautical engineering with some research experience in a branch of the aircraft industry or at a research establishment.

PENSION scheme in operation. Salary for a project engineer would not be less than £1,000 p.a.

APPLY, Personnel Officer, Irving Air Chute of Great Britain, Ltd., Icknield Way, Letchworth, Herts. 541-9013

A And C Licensed Engineer required to maintain Piper Apache based at Kano, Nigeria. Salary £1,050 p.a., plus bonus of £10 per revenue flying hour, with free board and accommodation. Applicant must be of bachelor status. Apply in writing to British United Airways, Ltd., Redhill Aerodrome, Surrey. 541-9011

STAFF PILOT wanted preferably with Venom experience. Apply, Manager, Airwork Services, Ltd., R.N.A.S. Brawdy, Pembs. 541-1

DC3 and DC4 Captains and First Officers and Viking First Officers required. Apply, Operations Manager, Continental Air Transport, Ltd., Southend Municipal Airport, Southend-on-Sea, Essex. 541-09012

A or B Licensed radio engineer, also X Electrical, salary range £980-£1,100 according to experience. Top rates for experienced unlicensed radio and engine fitters. Apply Channel Airways, Southend Airport. Phone, Rochford 56460. 541-7

PERMANENT appointments open with Independent for experienced senior captain and first officer with licences for Viking and Viscount. Existing staff notified of this advertisement. Full details in strictest confidence to The Principal, Box A405, care of THE AEROPLANE AND ASTRONAUTICS. 542-9017

COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF SUPPLY

AIRCRAFT AND MISSILE COMPONENT DEVELOPMENT COMPUTER AND SIMULATOR DEVELOPMENT

The Aeronautical Research Laboratories, located at Fishermen's Bend, Victoria, have vacancies for staff to carry out work on Guided Missile development. Applications are invited for the following positions:—

PRINCIPAL EXPERIMENTAL OFFICER (TWO (2) POSITIONS).

SALARY: £2525-£2720 (Australian currency).
DUTIES (1): Responsible for the technical direction of a team engaged on the design and development of aircraft and missile mechanical and electromechanical components.
QUALIFICATIONS: Degree or equivalent qualifications in Science or engineering, with considerable experience in the design and development of precision components for control of aircraft or guided missiles. Some experience in leadership of development groups desirable.
DUTIES (2): Responsible for the planning, conduct and analysis of the results of trials of guided missiles. Direct a small team engaged in this work.
QUALIFICATIONS: Degree or equivalent qualifications in mechanical or aeronautical engineering with considerable trials experience, preferably in guided missiles. Some experience in the analysis of trials results an advantage.

EXPERIMENTAL OFFICER, GRADE 3.

SALARY: £1730-£1950 (Australian currency).
DUTIES (5): Responsible to a Senior Scientific Officer for design development concerned with the development of analogue computation and simulation facilities. Supervision of staff engaged on this work.
QUALIFICATIONS: Degree or equivalent qualifications in electrical engineering or physics. Several years' experience in the above, or a related field of work.
TRAVEL: Under specified conditions, first class air/sea transport for the appointees and dependants (wife and dependent children) will be provided by the Commonwealth.
CONTRACT EMPLOYMENT: If desired by the successful candidates consideration may be given to entering into an agreement for a three (3) or five (5) year contract of employment in Australia. In this case the Commonwealth will bear the cost of return fares; together with the cost of removing the successful applicants' furniture and effects up to a maximum cost of £500 (Aust.); £250 each way.

APPLICATIONS: Forms obtainable from the Senior Representative (AV.68/1), DEPARTMENT OF SUPPLY, AUSTRALIA HOUSE, STRAND, LONDON, W.C.2 with whom completed applications should be lodged by 29th July 1960.

HANDLEY PAGE LIMITED

invite applications from

SENIOR, INTERMEDIATE and JUNIOR AERODYNAMICISTS

for work on the following:

a) Flight Test Programming and Analysis
b) Stability Calculations
c) Project Work
d) Flutter Calculations
e) Fundamental Aerodynamic Theory

Suitably qualified applicants will be offered progressive salaries at least comparable with those being paid in the engineering industries.

Please write to: Staff Officer,
HANDLEY PAGE LIMITED,
Cricklewood, London, N.W.2

COMMONWEALTH OF AUSTRALIA

WEAPONS RESEARCH ESTABLISHMENT

RESEARCH ON INSTRUMENTATION IN AERODYNAMICS

The Department of Supply invite applications for the following vacancy at the Weapons Research Establishment, Salisbury, South Australia:—

POSITION AND SALARY: SCIENTIFIC OFFICER, GRADE 3—£2,005-£2,265 (Aust.).
DUTIES: (Pos. No. 69)—Research on design and development of physical instruments, mainly mechanical and optical for aerodynamic research in wind tunnels and by free flight and rocket techniques.
QUALIFICATIONS: Honours degree in Science, with Physics and Mathematics as major subjects, together with some experience in the above field.
CONDITIONS: Under specified conditions, first class air/sea transport for the appointee and dependants (wife and dependent children) will be provided by the Commonwealth. Assistance will be given in obtaining housing accommodation.
CONTRACT EMPLOYMENT: If desired by the successful candidate consideration may be given to entering into an agreement for a three (3) or five (5) year contract of employment in Australia. In this case the Commonwealth will bear the cost of return fares; together with the cost of removing the successful applicant's furniture and effects up to a maximum cost of £500 (Aust.); £250 each way.
APPLICATIONS: Forms obtainable from the Senior Representative (AV.67/3), Department of Supply, Australia House, Strand, London, W.C.2, with whom completed applications should be lodged by 29th July, 1960.

SILVER CITY AIRWAYS, LTD.

INVITE applications from pilots with minimum qualifications Commercial Pilots licence, Instrument Rating, R/T licence and Performance A for operations based at Lydd. Apply in writing to Group Personnel Officer, 62 Brompton Rd., London, S.W.3. 542-9016

FIELD AIRCRAFT SERVICES, LTD.,
LONDON AIRPORT,

HAVE THE FOLLOWING VACANCIES.

ELECTRICAL INSPECTOR,
PREFERABLY WITH AN X LICENCE.

LICENSED RADIO SUPERVISORS.

LICENSED AIRCRAFT MAINTENANCE SUPERVISORS.

AIRCRAFT ELECTRICIANS AND RADIO MECHANICS.

EXPERIENCED MOTOR MECHANICS.

Hourly rate up to 6s. 0½d. per hour depending on experience. Good conditions. Canteen available.

PHONE PERSONNEL MANAGER,
SKYPORT 4111, EXT. 220. 541-2

IRANIAN AIRWAYS CO., Teheran, require the following:—

1. Two A- and C-licensed engineers with Viscount coverage, salary scale U.S. $500.00 plus U.S. $200.00 per month living allowance, 2-year contract, base Teheran.

2. One A-licensed radio engineer familiar with Bendix, Marconi and Collins, salary scale U.S. $400.00 plus U.S. $200.00 per month living allowance, 2-year contract, base Teheran.

3. One A- and C-licensed engineer with Dove coverage, salary scale U.S. $500.00 plus £55 per month living allowance, 2-year contract, base Abadan.

APPLY Blandford and Houdret, Ltd., 101 Leadenhall St., London, E.C.3. Phone, Avenue 5115. 542-9019

A and C engineer required for unsupervised Dove work abroad. Excellent pay and leave. Reply BOX A411, care of THE AEROPLANE AND ASTRONAUTICS. 541-6781

Southend Municipal Flying School
Commercial and Private Pilot's Licence.
Instructors Rating. Night Flying every night.
No entrance fee or subscription.
Austers £4 5s., Chipmunks £5 5s., dual or solo.
Contract rate £3 15s.
Municipal Airport, Southend-on-Sea, Essex
Phone: Rochford 56204

AIR MINISTRY invite applications for the following posts:—

(A) Editor to take charge of a Royal Air Force newspaper, soon to be introduced and issued fortnightly. Candidates must be fully competent journalists, experienced in ordinary news, news-editing and layout. The post is graded Senior Information Officer: Salary £1,490 to £1,850.

(B) Deputy Editor. Essential qualifications are a sound knowledge of journalism and experience in reporting, sub-editing and feature writing. The post is graded Information Officer: Salary £1,105 to £1,415.

22 Days annual leave, 5-day week for both posts for which preference will be given to candidates with experience of, or service with, the Royal Air Force. Applicants, who must be British-born subjects, should write stating age, qualifications and experience to Manager (P.E.1950—post A, —P.E.1951 post B), Ministry of Labour, Professional and Executive Register, Atlantic House, Farringdon Street, London, E.C.4. Closing date July 15, 1960. 541-5

FREE-LANCE PILOTS

ADVERTISER has requirement for free-lance pilots holding minimum Commercial Pilots Licence, Instrument rating, endorsed Bristol 170 or DC-3. Write, advising availability and rates to Box A412, care of THE AEROPLANE AND ASTRONAUTICS. 542-9021

SITUATIONS WANTED

A.T.P.L. Captain, 6,000 hrs., Viking, etc., available immediately, £3 hour. BOX A408, care of THE AEROPLANE AND ASTRONAUTICS. 543-x6645

TUITION

DENHAM LINK TRAINING CENTRE, £1 seven-day week. Denham 2161 and 3171. zzz-741

AVIGATION, LTD., provides full-time or postal tuition or a combination of these methods for M.o.A. pilot-navigator licences. Classroom instruction can be provided for A.R.B., General, certain specific types and performance schedule examinations. Link Training Dept. at Monarch 1364. For details apply Avigation, Ltd., 40 Central Chambers, Ealing Broadway, London, W.5. Phone, Ealing 8949. zzz-0719

INDIVIDUAL coaching as proved under our methods is the key to success. All professional pilot-navigator qualifications. Ministry-approved COM/IR/PPL. Refreshers; type ratings; performance; Link; R/T; flying. Home-study (correspondence) excellent alternative. Officially appointed Forces courses scheme. London School Air Navigation, 33 Ovington Square, Knightsbridge, S.W.3. Ken 8221. zzz-745

FLYING lessons, radio, D4 Link, navigation, ground instruction, private, instrument commercial training, single or twin-engined planes. Maitland Drewery, Biggin Hill Airport. Phone 2277. zzz-752

AIRWORK SERVICES TRAINING PERTH

BRITAIN'S ONLY AVIATION SCHOOL offering *all* these courses:—
* commercial and private licences
* instrument rating
* aircraft engineering
* full residential facilities

MINISTRY OF AVIATION APPROVED
Airwork Services Ltd., 35 Piccadilly, London, W.1

EXETER AIRPORT, LTD., AND PLYMOUTH AIRPORT, LTD., offer the least expensive and most comprehensive flying training available today. Contract rates from £2 17s. 6d. per hour; Auster Tiger, £3 12s. 6d.; Chipmunk, £5 5s.; Messenger, £4 18s. 6d. Twin Converston, £6 12s.; P.P.L. courses from £108 15s.; C.P.L. from £605; Instructor's course from £72 10s. Special attention to individual requirements. Full air traffic control, radio aid, VHF-DF and 24-hr. met. service. Grass or runways. Local accommodation from £3 10s.; airport, £5 15s. 6d. Exeter Airport, Ltd., Exeter 67433; Plymouth Airport, Ltd., Crownhill, Plymouth 72752. zzz-750

INSTRUMENT rating. The new July 1 procedures with VOR. D4 trainers. We are specialists, established 12 years. Phone, Knightsbridge 2089. Link Training Services, Ltd., 33 Ovington Square, London, S.W.3. 547-9018

SURREY AND KENT FLYING CLUB, Biggin Hill (BN9) 2255. M.o.A.-approved course. Tiger and Hornet Moths. Chipmunk and Prentice. Contract rates. Route 705, one hour from Victoria. 541-0713

MORLEY AVIATION, LTD. (Herts and Essex Aero Club, 1958). Aerodrome, Stapleford. M.C.A.-approved private pilot's licence course, Auster Gemini and Tiger aircraft; trial lesson, 35s.; 15 miles centre of London. (Central Line Underground to Theydon Bois, bus 250 to club); open every day. Phone, Stapleford 257. 541-695

TENDERS

FEDERAL POWER BOARD.

CONTRACT T.5.

PROVISION OF HELICOPTER SERVICE.

TENDERS ARE INVITED FOR THE MAINTENANCE ON CALL AT LUSAKA AIRPORT, NORTHERN RHODESIA, OF A HELICOPTER AND CREW FOR THE EXCLUSIVE USE OF THE FEDERAL POWER BOARD DURING THE MONTHS DECEMBER TO MAY INCLUSIVE.

The contract will be for a period of two years initially and will be on the basis of a fixed charge for the on-call service and a charge per flying-hour for such use of the helicopter as the Board may make.

TENDERS ARE ALSO INVITED FOR THE PROVISION OF A HELICOPTER ON A NORMAL CHARTER BASIS OVER A SIMILAR PERIOD DURING THE MONTHS OF JUNE TO NOVEMBER INCLUSIVE.

Tender documents may be obtained on application to the Secretary, FEDERAL POWER BOARD, P.O. BOX 630, SALISBURY, SOUTHERN RHODESIA. Closing date for tenders: August 15, 1960. 541-8

CROSS PERFECT PRECISION AIRCRAFT SPRING WASHERS
TO B.S. SPECIFICATION 2 SP.47
CROSS MFG. CO. (1938) LTD
COMBE DOWN, BATH. Tel.: Combe Down 2355/8

D.G.I. Ministry of Aviation Approved. A.R.B. etc.
R.L.A. GUARANTEED LAMINATED ALUMINIUM, BRASS & STEEL
Great Time Saver . . . Accuracy Assured . . . Sheets or Components.
SHIMS BY "ATTEWELL" PERFECTLY FLAT & FREE FROM BURRS.
B. ATTEWELL & SONS LIMITED
Makers of Aircraft Components for over 20 years.
Phones Iver 1102-3-4 IVER, BUCKINGHAMSHIRE. Grams "Reflection-Iver"

INDEX TO ADVERTISERS

Name	Page
A	
Aero-Enterprises (Boreham Wood), Ltd.	15
Airline Air Spares, Ltd.	14
Air Parts, Ltd.	16
Airwork, Ltd.	15, 16, 18
Attewell, B., & Sons, Ltd.	18
Aviation Traders (Engineering), Ltd.	14
B	
Blackburn Engines, Ltd.	11
Boulton Paul Aircraft, Ltd.	13
British Airline Pilots Association, The	16
British Overseas Airways Corporation (Middle East Airlines)	16
Burnley Aircraft Products, Ltd.	Inside Back Cover
C	
Commonwealth of Australia	17
Cross Manufacturing Co. (1938), Ltd.	16, 18
D	
Decca Radar, Ltd.	5
Desoutter Bros., Ltd.	10
E	
English Electric Aviation, Ltd.	Front Cover
G	
General Electric Co., Ltd.	4
H	
Handley Page, Ltd.	17
Hymatic Engineering Co., Ltd.	12
L	
Lockheed Aircraft	2, 3
Lockheed Precision Products Ltd.	Inside Front Cover
M	
Maitland Drewery Aviation, Ltd.	14
Martin-Baker Aircraft Co., Ltd.	8
Ministry of Aviation	16
R	
Rochdale Metal Products	16
Rolls-Royce, Ltd.	9
Rotax, Ltd.	Back Cover
S	
Shackleton, W. S., Ltd.	15
Southend Municipal Flying School	18
Staravia, Ltd.	16
U	
Ultra Electronics, Ltd.	1
V	
Vickers-Armstrongs (Aircraft), Ltd.	7
Vigors Aviation, Ltd.	15
Vokes, Ltd.	4
W	
Westland Aircraft, Ltd.	6

Printed in England and Published Weekly by the Proprietors, TEMPLE PRESS LIMITED, BOWLING GREEN LANE, LONDON, E.C.1.
Registered at the G.P.O. as a Newspaper. Second class postage paid at New York, N.Y.

AGENTS ABROAD—EUROPE—Messageries Dawson (S.A.), Paris; Messageries Hachette, et Cie, Paris; W. H. Smith & Son, Paris and Brussels. CANADA—Wm. Dawson Subscription Service Ltd., Toronto; Gordon & Gotch Ltd., Toronto. U.S.A.—Eastern News Co., 306 West 11th Street, New York, 14, N.Y. AFRICA—Central News Agency, Ltd., Cape Town; W. Dawson & Son (S.A.), Cape Town. ASIA—W. Thacker & Co., Ltd., P.O. 190 Bombay. AUSTRALIA and NEW ZEALAND—Gordon & Gotch (A'sia), Ltd.

B·A·P

Precision Fabrication work in Heat-resisting steel for Guided Missiles and related equipment

B.A.P. have development and production facilities for Guided Missile work, and offer manufacturers in the industry a first class fabrication service in heat-resisting steels for components and ancillary equipment

• • •

A.I.D. and A.R.B. approved

BURNLEY AIRCRAFT PRODUCTS LTD

FULLEDGE WORKS · BURNLEY · LANCS · ENGLAND

Telephone: 3121/2 and 3203 Burnley (3 lines) Grams: 'AIRCRAFT' Burnley

REPAIR DIVISION: Britannia Works, Queensgate, Burnley. Telephone: 4102

INDUSTRIAL FABRICATION DIVISION: Grosvenor St., Stoneyholme, Burnley. Telephone: 3184

Associated with RENFREW AIRCRAFT & ENGINEERING CO. LTD RENFREW, ONTARIO, CANADA

ROTAX TEST STAND FOR A.C. AND D.C. GENERATORS

The test stand shown gives precision test results on alternators up to 15 kVA, or D.C. generators up to 9 kW, over a speed range of 2,500 to 10,000 r.p.m. It can be supplied as a combined unit, with full instrumentation for testing both alternators and generators. With pressure gauges and flow indicators fitted, it is suitable for testing pumps, compressors and other hydraulic units.

- Unit to be tested, conveniently sited for observation whilst running.
- Test stand supplied complete with load banks and an air supply for cooling unit under test.
- Steel cabinet with hammered finish. Colour as required.

BIG RANGE . . . COMPLETE SERVICE

Rotax have developed a range of test stands for all types of generators and alternators and one should suit your needs. If you require a more specialised instrument Rotax engineers will be glad to advise you. Write or telephone for further information.

ROTAX

INDUSTRIAL GROUP, ROTAX LIMITED

WILLESDEN JUNCTION, LONDON, N.W.10 (ELGar 7777)

LUCAS-ROTAX (AUST.) PTY., LTD. Melbourne and Sydney, Australia.
LUCAS-ROTAX LTD. Toronto, Montreal and Vancouver, Canada.